



COMPETENCY BASED LEARNING MATERIALS (CBLMS)

ON

INDUSTRIAL PRODUCTIVITY IMPROVEMENT

**Skills for Industry Competitiveness and Innovation Program (SICIP)
Finance Division, Ministry of Finance**

Module Instruction:

Generic:

SL. No.	Unit Code	Module Title	Nominal Hours
1.	SICIP-LET-IPI-01-G	Carry out workplace interaction	15
2.	SICIP-LET-IPI-02-G	Operate in a team environment	15

Sector Specific:

SL. No.	Unit Code	Module Title	Nominal Hours
1.	SICIP-LET-IPI-01-S	Carry out measurements and calculations	10
2.	SICIP-LET-IPI-02-S	Apply green practices in LET sector	10

Occupation Specific:

SL. No.	Unit Code	Module Title	Nominal Hours
1.	SICIP-LET-IPI-01-O	Apply Work Processes for improving Productivity	20
2.	SICIP-LET-IPI-02-O	Apply Basic Industrial Engineering (IE) activities	70
3.	SICIP-LET-IPI-03-O	Apply Lean Manufacturing techniques	40
4.	SICIP-LET-IPI-04-O	Optimize Machine and Equipment Utilization	40
5.	SICIP-LET-IPI-05-O	Improve Workforce Efficiency	30
6.	SICIP-LET-IPI-06-O	Implement Quality Control and Assurance Techniques	20
7.	SICIP-LET-IPI-07-O	Monitor and Evaluate Productivity Performance	30

Module-1

Module: Applying Work Processes for Improving Productivity

Unit Code: SICIP-LET-IPI-01-O

**Skills for Industry Competitiveness and Innovation Program (SICIP)
Finance Division, Ministry of Finance**

Module-1

Module Title: Applying Work Processes for Improving Productivity

Unit code: SICIP-LET-IPI-01-O

Nominal Hours: 20 hours

Module Description: This module covers the skills, knowledge and attitudes required to apply work processes for improving productivity. It specifically includes the tasks of identifying key production stages in leather and footwear manufacturing, assessing current workflow and identify bottlenecks, recording process timings and material flow, analyzing causes of production delays and waste and interpreting areas for improvement.

Learning Outcomes: After completing of this module, the trainee will be able to;

1. Identify key production stages in leather and footwear manufacturing.
2. Assess current workflow and identify bottlenecks.
3. Record process timings and material flow.
4. Analyze causes of production delays and waste.
5. Interpret areas for improvement.

Assessment Criteria:

1. Major production processes in leather goods are identified.
2. Major production processes in footwear manufacturing are identified.
3. Products are identified.
4. Opportunities for time and cost reduction are recognized.
5. Work process data are collected and documented.
6. Current workflow in the production area is interpreted.
7. Work activities and movement of materials are monitored.
8. Delays and idle times are identified and noted.
9. Bottlenecks affecting productivity are identified.
10. Causes of workflow interruptions are analyzed.
11. Observations are documented for further evaluation.
12. Improvement areas are highlighted for corrective action.
13. Process timings at each production stage are recorded.
14. Movement of materials between workstations is tracked.
15. Start and finish times for each task are documented.
16. Idle and waiting times are identified and logged.
17. Data on material flow and handling are collected accurately.
18. Records are maintained using approved formats or tools.
19. Collected data are reviewed for consistency and accuracy.

20. Collected workflow and timing data are analyzed systematically.
21. Causes of production delays are identified and categorized.
22. Sources of material waste are detected and recorded.
23. Inefficient work practices are examined and noted.
24. Data are interpreted to determine root causes of inefficiency.
25. Analysis results are documented for improvement planning.
26. Findings from workflow analysis are reviewed and interpreted.
27. Areas requiring process improvement are identified.
28. Suggestions for reducing delays and waste are developed.
29. Options for simplifying or combining tasks are proposed.
30. Recommendations are aligned with productivity goals.
31. Improvement ideas are discussed with concerned personnel.
32. Proposed actions are documented for management consideration.

Information Sheet-1.1

Learning Outcome- 1: Applying Work Processes for Improving Productivity.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 1.1 Major production processes in leather goods.
- 1.2 Major production processes in footwear manufacturing.
- 1.3 Products.
- 1.4 Opportunities for time and cost reduction.
- 1.5 Work process data.

1.1 Major production processes in leather goods.

a) Material Selection

Choosing the right type of leather and materials based on the product's requirements for durability, appearance, and function.

b) Pattern Making

Creating patterns or templates that will be used to cut the leather into the correct shape and size for the final product.

c) Cutting

Cutting leather into pieces based on the patterns. This is done with precision to ensure the pieces fit together perfectly.

d) Skiving and Splitting

Thinning the leather at edges or specific areas to reduce bulk and allow for smooth assembly and stitching.

e) Edge Coloring and Creasing

Applying color to the edges of the leather goods and creating creases where necessary for aesthetic appeal and structure.

f) Assembling

Joining the cut leather pieces together to form the basic shape of the product, such as bags, wallets, or shoes.

Stitching

- #### g) Sewing the leather pieces together using strong threads to ensure durability and functionality.

h) Trimming and Cleaning

Cutting off excess material and cleaning the product to give it a neat, finished look.

i) Fitting and Attachment

Attaching accessories like zippers, buttons, or straps, and ensuring all components fit properly.

j) Finishing

Adding final touches such as polishing, dyeing, or waterproofing to enhance appearance and protect the leather.

k) Inspection

Checking the product for any defects in stitching, fitting, or quality, ensuring it meets the required standards.

l) Packaging

Preparing the finished product for shipment by securely packaging it to avoid damage during transportation.

1.2 Major production processes in footwear manufacturing.

a) Material Selection

Choosing appropriate materials (leather, rubber, fabric, etc.) based on the type of footwear being produced for durability, comfort, and design.

b) Cutting

Cutting the materials into the required shapes and sizes according to patterns to form different parts of the shoe.

c) Skiving and Splitting

Thinning certain areas of the material to reduce bulk and create smooth, even edges for stitching and assembly.

d) Stitching/Closing

Sewing the upper parts of the footwear together using strong threads, creating a durable bond between the different parts.

e) Lasting

Shaping the upper part of the shoe to fit the mold (last), ensuring it takes the correct form for the final product.

f) Sole Preparation

Preparing the sole material by cutting, shaping, and sometimes treating it to provide strength, grip, and durability.

g) Sole Attaching

Attaching the prepared sole to the upper part of the shoe, ensuring a secure and durable bond.

h) Finishing

Final touches such as polishing, coloring, and waterproofing to enhance the shoe's appearance, quality, and durability.

i) Inspection

Checking the finished footwear for any defects in stitching, sole attachment, or overall quality to ensure it meets standards.

j) Packaging

Packing the completed footwear securely for shipment, ensuring it is protected from damage during transport.

1.3 Products.

The leather and footwear sector produces a wide range of products used globally are:

- a) Shoes (Formal, Casual, Sports)
- b) Sandals and Slippers
- c) Boots (Work, Casual, Safety)
- d) Bags (Handbags, Backpacks, Travel Bags)
- e) Wallets and Purses
- f) Belts
- g) Gloves
- h) Leather Jackets and Apparel
- i) Accessories (Watch Straps, Key Holders)
- j) Leather Goods for Home Décor (Cushions, Organizers)

1.4 Recognizing opportunities to reduce time and cost.

Minimizing Setup and Changeover Time Using SMED

SMED (Single-Minute Exchange of Die) focuses on reducing the time it takes to switch from one production task to another. Implementing SMED techniques helps shorten setup times, increasing production efficiency and reducing downtime.

Standard Operating Procedures (SOP)

Standardizing work procedures ensures that tasks are performed consistently and efficiently. This reduces variations, minimizes errors, and improves overall productivity.

Improve Line Balancing Rate

Optimizing line balancing ensures that each workstation in the production process operates at full capacity without delays or idle time, improving the overall efficiency of the production line.

Reduce Bottlenecks

Identifying and addressing bottlenecks-points in the production process where work slows down-can help streamline operations, reducing delays and improving flow.

Minimize Rework

By improving the quality of work at each stage, reducing errors, and adhering to standards, rework can be minimized, saving both time and materials.

Improve Labor Efficiency

Improving labor efficiency through proper training, task allocation, and motivation leads to faster production, reduced waste, and lower labor costs.

1.5 Work process data.

SMV (Standard Minute Value)

SMV is a measure used to estimate the time required to produce a unit of product under standard working conditions. It helps set production goals and targets to improve efficiency.

Cycle Time

Cycle time is the time taken to produce one unit from start to finish. Reducing cycle time increases production efficiency and allows for higher output, improving overall productivity.

Machine Utilization

Machine utilization measures how effectively machines are used during production hours. Higher machine utilization indicates that machines are running at full capacity, reducing idle time and boosting productivity.

Materials Consumption

Materials consumption tracks the amount of raw materials used in the production process. Monitoring this helps optimize material usage, reduce waste, and enhance cost efficiency.

Defect Rate

The defect rate refers to the percentage of products that do not meet quality standards. Reducing defects results in higher quality products and reduces rework costs.

Reject Rate

Reject rate is the percentage of products that are completely discarded due to defects or failure to meet standards. Reducing this rate helps save materials, reduce waste, and improve production efficiency.

Labor Productivity

Labor productivity measures the amount of output produced per unit of labor input. Improving labor productivity through training and efficient task allocation increases production speed and efficiency.

Worker Skills Matrix

The worker skills matrix is a tool that tracks the skills and capabilities of each worker. By assessing skills, supervisors can better allocate tasks, improve training, and ensure the right people are assigned to the right jobs.

Self-Check -1.1

Short Questions:

1. **What is material selection in leather goods production?**

Answer:

2. **What is skiving and splitting?**

Answer:

3. **What is edge coloring and creasing?**

Answer:

4. **What is the final step in leather goods production?**

Answer:

5. **What is material selection in footwear production?**

Answer:

6. **What are some products made in the leather and footwear sector?**

Answer:

7. **What is SMED in production?**

Answer:

8. **What is SMV (Standard Minute Value)?**

Answer:

Answer Key -1.1

Short Questions with Answers:

1. **What is material selection in leather goods production?**

Answer: Material selection is choosing the right type of leather and materials based on the product's needs for durability, appearance, and function.

2. **What is skiving and splitting?**

Answer: Skiving and splitting involve thinning leather at edges or specific areas to reduce bulk and allow smooth stitching.

3. **What is edge coloring and creasing?**

Answer: Edge coloring adds color to the leather edges, while creasing creates folds for structure and aesthetic appeal.

4. **What is the final step in leather goods production?**

Answer: The final step is finishing, which includes polishing, dyeing, or waterproofing to enhance appearance and protect the leather.

5. **What is material selection in footwear production?**

Answer: Material selection is choosing materials like leather, rubber, or fabric, based on durability, comfort, and design for the footwear.

6. **What are some products made in the leather and footwear sector?**

Answer: The sector produces shoes, sandals, boots, bags, wallets, belts, gloves, jackets, and accessories like watch straps.

7. **What is SMED in production?**

Answer: SMED (Single-Minute Exchange of Die) helps reduce setup time, increasing production efficiency by minimizing downtime.

8. **What is SMV (Standard Minute Value)?**

Answer: SMV is the time required to produce a unit under standard conditions, used to set production targets.

Task Sheet- 1.1

Task Name: Perform Production Process Mapping (Flow Diagram)

Instructions:	
Read and understand the directions carefully: ▪ this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ this assessment activity will be used to measure your underpinning knowledge and skills ▪ you will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ you have two (2) hours to complete this demonstration.	
Working Procedure:	
▪ Define Objective: Understand the purpose and scope of mapping the process. ▪ Collect Data: Gather information about the current production steps. ▪ Identify Steps: Break the production into key steps. ▪ Map Process: Draw the process flow using symbols. ▪ Verify Flow: Check the diagram with team members to ensure accuracy. ▪ Refine and Finalize: Improve the diagram for clarity and finalize. ▪ Present the slide deck.	
Specific Information:	
▪ Collect required supplies and materials for performing the production process mapping (flow diagram). ▪ Read and understand the provided materials carefully before starting the task. ▪ Prepare a workspace with necessary tools to design the flow diagram. ▪ Submit the finalized process flow diagram to the Trainer or relevant authority for approval.	
Resources Required:	
Tools and materials:	• Computer or laptop • Internet access • Paper • Markers • Sticky Note • Flip Chart • Masking Tape

Information Sheet- 1.2

Learning Outcome-2: Assess current workflow and identify bottlenecks.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 2.1 Current workflow in the production area.
- 2.2 Work activities and movement of materials.
- 2.3 Bottlenecks affecting productivity.
- 2.4 Causes of workflow interruptions.

1. **Current workflow in the production area.**

To improve productivity, it's essential to assess the current workflow in the production area. Understanding each stage and identifying bottlenecks can help streamline processes, reduce delays, and optimize output.

a) **Cutting**

Cutting involves shaping raw materials, like leather or fabric, into required pieces for the product. This step is crucial for accuracy and preparation for the next stages.

b) **Stitching**

Stitching is the process of sewing together cut pieces of material to form the product's structure. High-quality stitching ensures the durability and appearance of the product.

c) **Lasting**

Lasting shapes the upper part of the shoe or product to fit the mold (last), ensuring proper form and comfort, especially for footwear.

d) **Finishing**

Finishing involves applying final touches such as dyeing, polishing, and protective coatings to enhance the product's appearance and durability.

e) **Packaging**

Packaging prepares the finished product for shipping. It includes labeling, boxing, and ensuring safe transportation to customers or retailers.

f) **Material Handling Processes**

Material handling refers to the movement of raw materials, semi-finished goods, and finished products within the production area. Efficient handling ensures smooth workflow and prevents delays.

2. **Work activities and movement of materials.**

Efficient work activities and the movement of materials are essential for smooth production flow. Proper handling and transportation of raw materials, semi-finished goods, and finished products ensure timely delivery and reduce delays in the production process.

a) **Raw Materials**

Raw materials are the initial components (like leather, rubber, or fabric) used in production. These materials need to be stored and transported carefully to avoid damage or waste.

b) **Semi-Finished Goods**

Semi-finished goods are products that have undergone some processing but require further steps before becoming finished products. These goods must be handled carefully as they move through various stages of production.

c) **Finished Goods**

Finished goods are the final products that are ready for packaging and shipment. Efficient movement and storage of finished goods are crucial for ensuring timely delivery to customers.

d) **Manual Handling**

Manual handling refers to workers physically moving materials or products by lifting, carrying, or pushing. It is important to ensure safe practices to avoid injuries and maintain productivity.

e) **Conveyors**

Conveyors are mechanical systems used to move materials efficiently from one production stage to another. They reduce manual labor and help maintain a continuous flow of goods.

f) **Trolleys**

Trolleys are wheeled carts used to move materials and products within the production area. They help in transporting items more easily over short distances, reducing the need for manual lifting.

g) **Forklifts**

Forklifts are powered vehicles used to lift and transport heavy materials, particularly in areas where large quantities of raw materials or finished goods need to be moved quickly and efficiently.

3. **Bottlenecks affecting productivity.**

Bottlenecks are points in the production process where work slows down, causing delays and reducing overall productivity. Identifying and addressing bottlenecks is essential to streamline operations and improve efficiency.

a) **Slow Machine Processing**

Machines that are slow or malfunctioning can create delays, leading to backlogs in production. Regular maintenance and upgrading equipment can help reduce these delays.

b) **Material Shortages**

If raw materials are not available when needed, production can halt or slow down. Efficient inventory management and better supplier coordination can help prevent

material shortages.

c) **Workforce Shortages or Skill Gaps**

A lack of skilled workers or insufficient staffing can slow down production. Training and effective workforce management can help minimize this issue.

d) **Inefficient Layout or Flow**

A poor production layout or inefficient material flow can cause delays as workers and materials must travel longer distances. Optimizing the layout can improve workflow and reduce unnecessary movement.

e) **Quality Control Issues**

Quality control checks that take too long or have high defect rates can slow down production. Streamlining quality checks and improving training can help speed up this process.

f) **Communication Gaps**

Lack of clear communication between teams can cause delays in decision-making, leading to downtime. Improved communication tools and regular meetings can address this.

g) **Bottleneck in Assembly or Packing**

Slow assembly or packing stages can delay the final product from moving forward. Improving the efficiency of these processes ensures quicker completion and shipment.

4. **Causes of workflow interruptions.**

Workflow interruptions can significantly impact productivity, causing delays, increased costs, and reduced efficiency. Identifying the causes of these interruptions helps in finding solutions to streamline operations.

a) **Equipment Failure**

When machines break down or malfunction, production comes to a halt. Regular maintenance and timely repairs can help minimize these disruptions.

b) **Material Delays**

Delays in receiving raw materials or semi-finished goods can stop production lines. Efficient inventory management and strong supplier relationships help prevent this issue.

c) **Worker Absenteeism**

Lack of workers due to sickness, absenteeism, or lack of skills can disrupt the workflow. Proper staffing and cross-training employees can reduce this problem.

d) **Poor Communication**

Miscommunication between teams or departments can lead to errors or delays in decision-making, affecting the flow of work. Clear communication channels and regular updates help prevent this.

e) **Inefficient Process Design**

A poorly designed workflow or layout can cause unnecessary delays as workers or materials need to travel longer distances. Optimizing the production layout can improve efficiency.

f) **Quality Control Issues**

Frequent rework or quality checks that take too long can halt progress. Streamlining quality control processes and improving training can reduce this interruption.

g) **Lack of Training**

Workers who are not properly trained may cause delays in the production process. Regular training ensures that all staff are skilled and can perform tasks efficiently.

Self-Check -1.2

Short Questions:

1. What is cutting in the production process?

Answer:

2. Why is it important to handle raw materials carefully in production?

Answer:

3. What is manual handling in production?

Answer:

4. How do conveyors help in production?

Answer:

5. What is a bottleneck in the production process?

Answer:

6. What causes slow machine processing in production?

Answer:

7. What happens when equipment fails in the production process?

Answer:

8. Why is inefficient process design a cause of workflow interruptions?

Answer:

Answer Key -1.2

Short Questions with Answers:

1. What is cutting in the production process?

Answer: Cutting shapes raw materials like leather or fabric into required pieces for the product, ensuring accuracy for the next stages.

2. Why is it important to handle raw materials carefully in production?

Answer: Proper handling ensures raw materials are not damaged or wasted, which is essential for efficient production.

3. What is manual handling in production?

Answer: Manual handling refers to workers physically moving materials or products by lifting, carrying, or pushing, which requires safe practices.

4. How do conveyors help in production?

Answer: Conveyors move materials efficiently between production stages, reducing manual labor and ensuring a continuous flow.

5. What is a bottleneck in the production process?

Answer: A bottleneck is a point in production where work slows down, causing delays and reducing overall productivity.

6. What causes slow machine processing in production?

Answer: Slow or malfunctioning machines create delays, leading to backlogs in production. Regular maintenance can help prevent this.

7. What happens when equipment fails in the production process?

Answer: Equipment failure halts production. Regular maintenance and timely repairs help minimize disruptions.

8. Why is inefficient process design a cause of workflow interruptions?

Answer: Poor process design leads to unnecessary delays as workers or materials have to travel longer distances. Optimizing layout improves efficiency.

Task Sheet - 1.2

Task Name: Identify bottleneck operation from process flow diagram.

Instructions:	
Read and understand the directions carefully: - this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. - this assessment activity will be used to measure your underpinning knowledge and skills - you will have fifteen (15) minutes to familiarize yourself with the resources to be used - you have two (2) hours to complete this demonstration.	
Working Procedure:	
- Observe each operation thoroughly to ensure all activities and delays are captured. - Understand and document inputs and outputs for every process step. - Collect multiple cycle time readings for each operation. - Calculate the average cycle time to establish standard performance. - Identify the bottleneck operation based on the highest cycle time or lowest throughput. - Map all values onto the process flow diagram for visual analysis. - Present and review findings with the trainer for validation and feedback.	
Specific Information:	
- Collect required materials: Process flow diagram, data on process times, and resource usage. - Review the training materials and guidelines before starting the task. - Prepare a workspace with tools like computers or paper for analyzing the diagram. - Ensure all team members or relevant stakeholders are available for review and validation. - Submit the analysis and identified bottleneck(s) to the trainer or relevant authority for review.	
Resources Required:	
Tools and materials:	- Computer or laptop - Internet access - Stop watch - Video camera - Paper - Markers - Sticky note - Flip chart - Masking Tape

Information Sheet- 1.3

Learning Outcome-3: Record process timings and material flow.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 3.1 Process timings at each production stage.
- 3.2 Idle and waiting times.
- 3.3 Data on material flow and handling.
- 3.4 Records using approved formats or tools.

1. **Process timings at each production stage.**

Accurate tracking of process timings and material flow at each production stage helps identify inefficiencies, reduce delays, and improve overall productivity.

Cutting: The time taken to cut raw materials (such as leather or fabric) into the required shapes.

Stitching: The time spent stitching the cut pieces together.

Lasting: The time required to shape the upper part of the footwear or product to fit the last (mold).

Finishing: The process of adding final touches such as polishing, dyeing, or coating.

Packaging: The time taken to pack finished products for shipment.

Material Flow: Tracking the movement of materials through the production process-from raw materials to semi-finished goods to finished products.

2. **Idle and waiting times.**

Idle and waiting times refer to periods when workers, machines, or materials are not actively involved in the production process.

Man: Idle time for workers occurs when they are waiting for instructions, materials, or equipment.

Machine: Machine idle time happens when equipment is not in use due to breakdowns, maintenance, or waiting for materials.

Method: Method-related idle time refers to delays caused by inefficient or outdated production methods.

Materials: Waiting time for materials occurs when raw materials, semi-finished goods, or

components are delayed in arriving at the production stage.

3. **Data on material flow and handling.**

Tracking data on material flow and handling is essential for efficient production.

Quantity: Data on the quantity of materials ensures that there is enough stock to meet production needs without overstocking or running out of materials.

Quality: Quality data tracks the condition of materials, ensuring they meet the required standards for production.

Size: Size data ensures that materials are cut or used according to the correct dimensions for each product.

Color: Color data is important for products like footwear or leather goods where color consistency is essential.

Brand: Brand data tracks the source or supplier of materials, which can impact quality, cost, and availability.

4. **Records using approved formats or tools.**

Recording production data and work processes in standardized formats or using approved tools helps maintain consistency, accuracy, and ease of access.

Log Sheets: Log sheets are used to manually record key production data such as machine operation times, material usage, and quality checks.

Time-Study Charts: Time-study charts are used to record the time taken for each step of a production process.

Digital Tools: Digital tools like spreadsheets, apps, or digital forms are used to record, store, and analyze data more efficiently.

Software: Specialized software, such as Manufacturing Resource Planning (MRP) or Enterprise Resource Planning (ERP) systems, automates data collection, reporting, and analysis.

Self-Check – 1.3

Short Questions:

1. **Question:** What is the role of a compliance officer?
Answer:
2. **Question:** What are the key responsibilities of a compliance officer?
Answer:
3. **Question:** How does a compliance officer liaise with other departments?
Answer:
4. **Question:** What is the compliance officer's role in regulatory bodies?
Answer:
5. **Question:** Why is record-keeping important for a compliance officer?
Answer:
6. **Question:** What documents does a compliance officer maintain?
Answer:
7. **Question:** What is the accountability of a compliance officer regarding documentation?
Answer:
8. **Question:** How does the compliance officer ensure the accuracy of records?
Answer:

Answer Key – 1.3

Short Questions with Answers:

1. Why is tracking process timings important in production?

Answer: Tracking process timings helps identify inefficiencies, reduce delays, and improve overall productivity by ensuring each stage operates optimally.

2. What happens during the finishing stage?

Answer: Finishing adds final touches like polishing, dyeing, or protective coatings to enhance the product's appearance and durability.

3. What is idle time for workers?

Answer: Idle time for workers occurs when they are waiting for instructions, materials, or equipment before they can proceed with their tasks.

4. What causes machine idle time?

Answer: Machine idle time happens when equipment is not in use due to breakdowns, maintenance, or waiting for materials to arrive.

5. What is method-related idle time?

Answer: Method-related idle time refers to delays caused by inefficient or outdated production methods.

6. Why is quality data important in material handling?

Answer: Quality data ensures that materials meet the required standards for production, preventing defects and inefficiencies.

7. How does size data help in material handling?

Answer: Size data ensures that materials are cut or used according to the correct dimensions for each product, avoiding errors in production.

8. How do digital tools help in production data recording?

Answer: Digital tools like spreadsheets and apps store, analyze, and manage data more efficiently, improving productivity and accuracy.

Task Sheet - 1.3

Task Name: Identify Material Flow & Record Delay Causes Within Factory Value Chain.

Instructions:	
Read and understand the directions carefully: ▪ this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ this assessment activity will be used to measure your underpinning knowledge and skills ▪ you will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ you have two (2) hours to complete this demonstration.	
Working Procedure:	
▪ Understand the factory value chain. ▪ Record material flow and travel distance between each production section. ▪ Capture material handling time and method. ▪ Observe operations and log worker idle or waiting time, if any. ▪ Review and validate observed delay reasons with the trainer.	
Specific Information:	
▪ Collect materials: Factory layout, material flow data, production schedule. ▪ Review training materials before starting. ▪ Prepare workspace: Computers or tools for tracking material flow. ▪ Involve key team members for insights and validation. ▪ Record delay causes in the value chain. ▪ Submit the report to the trainer for review.	
Resources Required:	
Tools and materials:	• Computer or laptop • Internet access • Stop watch • Video camera • Paper • Markers • Sticky note • Flip chart • Masking Tape

Information Sheet- 1.4

Learning Outcome-4: Analyze causes of production delays and waste.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 4.1 Collected workflow and timing data.
- 4.2 Sources of material waste.
- 4.3 Root causes of inefficiency.

4.1 Collected workflow and timing data.

Collecting workflow and timing data is crucial for understanding how production processes operate. This data helps identify inefficiencies, delays, and areas for improvement in production.

Workflow Charts: Workflow charts visually represent the sequence of tasks, material movement, and interactions between different stages of production.

Process Timings: Process timings track the amount of time taken for each task or step in the production process.

Material Movement: Material movement data tracks how raw materials, semi-finished goods, and finished products move through the production line.

Production Records: Production records include data on the quantity of products produced, machine usage, and workforce performance.

4.2 Sources of material waste.

Material waste can arise from various sources in the production process. Identifying these sources helps in minimizing waste, reducing costs, and improving overall efficiency.

Cutting Waste: Cutting waste occurs when materials, such as leather or fabric, are cut incorrectly or inefficiently, leaving offcuts or unusable scraps.

Defective Products: Defective products result from errors in production, such as faulty stitching or incorrect assembly.

Scrap: Scrap refers to leftover material that cannot be reused in production. This may include small leather pieces or fabric remnants.

Excess Inventory: Excess inventory refers to holding more raw materials or finished goods than needed.

4.3 Root causes of inefficiency.

Inefficiency in the production process can stem from various root causes.

Poor Planning: Lack of proper planning in scheduling, resource allocation, or material procurement can lead to delays, misalignment in production, and underutilization of resources.

Equipment Failure: Frequent breakdowns or inadequate maintenance of machines disrupt production and cause delays, leading to decreased output and increased downtime.

Skill Gaps: A lack of training or insufficiently skilled workers can result in errors, slow processes, and lower-quality output, ultimately slowing down production.

Inefficient Processes: Outdated or poorly designed processes can lead to unnecessary steps, excessive handling, or unnecessary motion, resulting in wasted time and effort.

Communication Gaps: Lack of clear communication between teams or departments can cause misunderstandings, delays, and missed opportunities for quick adjustments during production.

Material Shortages or Delays: Inconsistent supply or late delivery of materials can halt production, cause delays, and increase the time spent waiting for materials, which disrupts workflow.

Lack of Standardization: Without standardized procedures (SOP) workers may follow different methods, leading to inconsistencies, mistakes, and wasted time in completing tasks.

Self-Check – 1.4

Short Questions:

1. **Question:** Why is collecting workflow and timing data important?

Answer:

2. **Question:** What are workflow charts used for?

Answer:

3. **Question:** What is the purpose of process timings in production?

Answer:

4. **Question:** What is material movement data?

Answer:

5. **Question:** What do production records include?

Answer:

6. **Question:** What is cutting waste?

Answer:

7. **Question:** How does excess inventory contribute to waste?

Answer:

8. **Question:** What are some root causes of inefficiency in production?

Answer:

Answer Key – 1.4

Short Questions with Answers:

1. **Question:** Why is collecting workflow and timing data important?

Answer: Collecting workflow and timing data helps identify inefficiencies, delays, and areas for improvement in production processes.

2. **Question:** What are workflow charts used for?

Answer: Workflow charts visually represent the sequence of tasks, material movement, and interactions between different stages of production.

3. **Question:** What is the purpose of process timings in production?

Answer: Process timings track how long each task or step in the production process takes, helping to identify delays and inefficiencies.

4. **Question:** What is material movement data?

Answer: Material movement data tracks how raw materials, semi-finished goods, and finished products move through the production line.

5. **Question:** What do production records include?

Answer: Production records include data on the quantity of products produced, machine usage, and workforce performance.

6. **Question:** What is cutting waste?

Answer: Cutting waste occurs when materials are cut incorrectly or inefficiently, leaving offcuts or unusable scraps.

7. **Question:** How does excess inventory contribute to waste?

Answer: Excess inventory refers to holding more raw materials or finished goods than needed, leading to storage issues and increased waste.

8. **Question:** What are some root causes of inefficiency in production?

Answer: Root causes include poor planning, equipment failure, skill gaps, inefficient processes, communication gaps, material shortages, and lack of standardization.

Task Sheet 1.4

Task Name: Identify production delay reasons in each production floor.

Instructions:	
Read and understand the directions carefully: ▪ this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ this assessment activity will be used to measure your underpinning knowledge and skills ▪ you will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ you have two (2) hours to complete this demonstration.	
Working Procedure:	
▪ Define Scope – Select the production floor or section to be observed. ▪ Map Operations – List all key operations in sequence. ▪ Observe Process Flow – Watch material, worker, and machine movement. ▪ Record Delay Events – Log waiting, stoppages, rework, and idle time with timestamps. ▪ Classify Reasons – Group delays by Man, Machine, Material, Method, or Environment. ▪ Identify Critical Delays – Highlight the most frequent or longest delay points. ▪ Review & Validate – Share findings with the trainer for confirmation and feedback.	
Specific Information:	
▪ Collect materials: Production schedules, floor layouts, and previous delay records. ▪ Review training materials and process documentation. ▪ Prepare workspace: Computers or tools for tracking delays and analyzing data. ▪ Involve floor supervisors or team members for insights. ▪ Record delay reasons at each production floor. ▪ Submit findings to the trainer or relevant authority for evaluation.	
Resources Required:	
Tools and materials:	• Computer or laptop • Internet access • Stop watch • Video camera • Paper • Markers • Sticky note • Flip chart • Masking Tape

Information Sheet- 1.5

Learning Outcome-5: Interpret areas for improvement.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 1.1 Findings from workflow analysis.
- 1.2 Areas requiring process improvement.
- 1.3 Suggestions for reducing delays and waste.
- 1.4 Recommendations with productivity goals.
- 1.5 Improvement ideas.

5.1 Findings from workflow analysis.

Conducting a workflow analysis provides valuable insights into production inefficiencies.

Data on Process Timings: Tracking the time taken for each production step helps identify stages where delays occur. Long process times can point to inefficiencies.

Material Flow: Analyzing material flow tracks how raw materials, semi-finished goods, and finished products move through the production process.

Bottlenecks: Bottlenecks are points where production slows down due to limited capacity, such as slow machines, delays in material supply, or inefficient processes.

Idle Times: Idle times occur when workers, machines, or materials are not actively involved in production due to delays or inefficiencies.

Waste: Waste in production includes excess materials, defective products, or inefficient processes that lead to wasted time or resources.

5.2 Areas requiring process improvement.

Identifying areas requiring process improvement is crucial to enhancing productivity, reducing waste, and optimizing the overall production flow.

Equipment Maintenance and Downtime: Machines that frequently break down or require maintenance disrupt production.

Workflow Optimization: Inefficient workflow designs lead to unnecessary movement of materials and workers, slowing down production.

Material Handling: Improper or inefficient movement of raw materials, semi-finished goods, and finished products can cause delays and increase handling costs.

Quality Control: Slow or inconsistent quality checks can lead to delays and increased rework.

Inventory Management: Excess inventory or material shortages can disrupt production.

Communication Gaps: Poor communication between teams can lead to delays in decision-making and execution.

5.3 Suggestions for reducing delays and waste.

To improve productivity and reduce waste, consider the following suggestions:

Streamline Workflow: Reorganize workstations and processes to eliminate unnecessary movement and reduce delays.

Implement Preventive Maintenance: Regularly maintain machinery to prevent breakdowns and minimize downtime.

Optimize Material Handling: Use automated systems for faster and more efficient movement of materials throughout production.

Enhance Worker Training: Provide continuous training to improve skills and reduce errors, speeding up production.

Improve Quality Control: Integrate quick and efficient quality checks into the production process to reduce defects and rework.

Manage Inventory Effectively: Implement just-in-time inventory to reduce excess stock and avoid material shortages.

Foster Clear Communication: Ensure clear and timely communication between teams to avoid misunderstandings and delays.

5.4 Recommendations with productivity goals.

To improve productivity and achieve better efficiency in the production process, consider the following recommendations with clear productivity goals:

Set Clear Performance Targets: Establish specific, measurable production targets (e.g., units per hour) for each stage to drive efficiency and track progress.

Optimize Machine Utilization: Increase machine utilization by reducing downtime through preventive maintenance and efficient scheduling, aiming for 90% or higher machine uptime.

Reduce Cycle Time: Work to reduce cycle time by 10-20% through better task allocation and eliminating bottlenecks, improving overall throughput.

Improve Labor Efficiency: Set goals to increase labor productivity by 15% through training, better task management, and clear communication.

Implement Lean Practices: Adopt lean manufacturing principles to reduce inefficiencies in material handling and production flow, targeting a 15% improvement in overall workflow.

Increase Output Quality: Aim to reduce defects and rework by 20% through stricter quality checks, improved employee training, and process standardization.

5.5 Improvement ideas.

Here are some practical improvement ideas to boost productivity, reduce waste, and streamline operations in the production process:

Adopt Automation: Introduce automated machines for repetitive tasks like cutting, stitching, and material handling to increase speed and reduce human error.

Standardize Processes: Create standard operating procedures (SOPs) for each task to ensure consistency, minimize errors, and speed up training.

Improve Layout and Flow: Optimize the factory layout to minimize movement of workers and materials, reducing time spent transporting items between stages.

Implement Just-in-Time (JIT) Inventory: Use JIT inventory practices to reduce excess stock, minimize waste, and improve material flow throughout production.

Focus on Preventive Maintenance: Set up regular maintenance schedules for machines to reduce unexpected breakdowns and improve overall machine efficiency.

Self-Check – 1.5

Short Questions:

1. **Question:** What is the importance of workflow analysis in production?
Answer:

2. **Question:** What is tracked during a workflow analysis?
Answer:

3. **Question:** What areas require process improvement in production?
Answer:

4. **Question:** How can you reduce delays and waste in production?
Answer:

5. **Question:** What is the goal of setting performance targets in production?
Answer:

6. **Question:** How can machine utilization be optimized?
Answer:

Answer Key – 1.5

Short Questions with Answers:

1. **Question:** What is the importance of workflow analysis in production?
Answer: Workflow analysis helps identify inefficiencies, delays, and areas for improvement in the production process, ensuring better productivity.
2. **Question:** What is tracked during a workflow analysis?
Answer: Workflow analysis tracks process timings, material flow, bottlenecks, idle times, and waste to identify inefficiencies.
3. **Question:** What areas require process improvement in production?
Answer: Key areas include equipment maintenance, workflow optimization, material handling, quality control, inventory management, and communication.
4. **Question:** How can you reduce delays and waste in production?
Answer: Streamline workflows, implement preventive maintenance, optimize material handling, enhance worker training, improve quality control, and manage inventory effectively.
5. **Question:** What is the goal of setting performance targets in production?
Answer: Performance targets help track progress, drive efficiency, and improve overall production output, such as units per hour.
6. **Question:** How can machine utilization be optimized?
Answer: Machine utilization can be optimized by reducing downtime through preventive maintenance and efficient scheduling, aiming for 90% or higher uptime.

Task Sheet 1.5

Task Name: Identify and Share productivity/process improvement suggestion/technique.

Instructions:	
Read and understand the directions carefully: ▪ this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ this assessment activity will be used to measure your underpinning knowledge and skills ▪ you will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ you have two (2) hours to complete this demonstration.	
Working Procedure:	
▪ Select Process Area – Choose one production section or operation to focus on. ▪ Observe Current Method – Study material flow, worker motion, and machine usage. ▪ Collect Basic Data – Note cycle time, output, defects, and idle or waiting time. ▪ Identify Improvement Opportunities – Highlight delays, waste, or rework points. ▪ Develop Suggestions – Propose 1–2 practical improvements (layout, method, tools, or skills). ▪ Estimate Impact – Indicate expected time, cost, or quality benefits. ▪ Present & Validate – Share ideas with the trainer for review and feedback.	
Specific Information:	
▪ Collect materials: Current process documentation, performance data, and improvement guidelines. ▪ Review training materials on productivity and process improvement techniques. ▪ Prepare workspace: Computers or tools for documenting suggestions and analyzing data. ▪ Involve relevant team members for feedback and insights. ▪ Identify improvement suggestions/techniques based on analysis. ▪ Share suggestions with the team or relevant authority for review.	
Resources Required:	
Tools and materials:	• Computer or laptop • Internet access • Stop watch • Video camera • Paper • Markers • Sticky note • Flip chart • Masking Tape

Module-2

Module: Applying Basic Industrial Engineering (IE) Activities

Unit Code: SICIP-LET-IPI-02-O

**Skills for Industry Competitiveness and Innovation Program (SICIP)
Finance Division, Ministry of Finance**

Module-2

Module Title: Applying Basic Industrial Engineering (IE) Activities.

Unit code: SICIP-LET-IPI-02-O

Nominal Hours: 70 hours

Module Description: This module covers the skills, knowledge & attitudes required to apply industrial engineering (IE) activities. It specifically includes the task of identifying different types of line layout, performing work study process, preparing skills matrix for production line, implementing line balancing in production, developing value stream mapping and preparing efficiency report.

Learning Outcomes: After completing of this module, the trainee will be able to;

1. Identify different types of line layout.
2. Perform work study process.
3. Prepare skills matrix for production line.
4. Implement line balancing in production.
5. Develop value stream mapping.
6. Prepare efficiency report.

Assessment Criteria:

1. Different types of production line layouts are identified and listed.
2. Features of each layout type are observed and recorded.
3. Advantages and disadvantages of various line layouts are analyzed.
4. Layout suitability is evaluated based on product type and workflow.
5. Existing layouts are compared with recommended standards.
6. Selected line layout is implemented in the production area.
7. Work study process is performed to analyze and improve productivity.
8. Method study is conducted to identify the most efficient way of performing tasks.
9. Current work methods are observed, recorded, and evaluated.
10. Time study is carried out to measure task duration accurately.
11. Standard time for each operation is calculated and documented.
12. Findings from method and time studies are analyzed for process improvement.
13. Results are reported and used to establish performance benchmarks.
14. Skills variables required for the production line are identified and listed.
15. Skill weights are determined based on task importance and complexity.
16. Skill levels and grades are defined according to standards.
17. Multi-skilled criteria are identified.
18. Data on worker competencies are collected and recorded.
19. Skills matrix is prepared showing workers' proficiency across tasks.
20. Completed skills matrix is reviewed and updated for accuracy and use in workforce planning.
21. Principles and objectives of line balancing are understood and explained.
22. Work tasks and process steps are analyzed for balance and efficiency.
23. Standard line balancing methods are applied to distribute workload evenly.
24. Real-time line balancing adjustments are implemented during production.
25. Idle time and bottlenecks are identified and minimized.
26. Production flow is monitored to ensure smooth operation.
27. Line balancing results are reviewed and documented for continuous improvement.
28. The concept and purpose of Value Stream Mapping (VSM) are understood and explained.

29. Current production processes are analyzed to identify value-adding and non-value-adding activities.
30. Appropriate VSM level is determined based on process scope and objectives.
31. Data on material flow, information flow, and process time are collected.
32. Value Stream Map is prepared to visualize the entire workflow.
33. Areas for improvement are identified through the completed VSM.
34. The finalized VSM is reviewed and used for process optimization planning.
35. Data on machine performance and production output are collected accurately.
36. Overall Equipment Effectiveness (OEE) is calculated based on availability, performance, and quality.
37. Overall Working Efficiency (OWE) is measured to evaluate labor and process productivity.
38. Collected data are analyzed to identify performance gaps and improvement areas.
39. Efficiency results are summarized and documented in a standard report format.
40. Reports are reviewed with relevant personnel for validation and decision-making.
41. Recommendations for improving OEE and OWE are included in the final efficiency report.

Information Sheet 2.1

Learning Outcome-1: Identify different types of line layout.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 1.1 Different types of production line layouts.
- 1.2 Features of each layout type.
- 1.3 Advantages and disadvantages of various line layouts.

1.1 Different types of production line layouts.

Product Layout: In a product layout, workstations and equipment are arranged in a sequential order based on the steps required to produce a specific product.

Process Layout: A process layout groups similar processes or machines together, allowing flexibility in handling different products.

Hybrid Layout: A hybrid layout combines elements of both product and process layouts.

Fixed Position Layout: In a fixed position layout, the product stays in one location, and materials, labor, and equipment are brought to the product.

1.2 Features of each layout type.

Product Layout

- **Efficiency:** Ideal for high-volume, standardized production as it minimizes movement and reduces cycle time.
- **Flow:** Smooth and continuous production flow, with each workstation arranged in a sequence based on product assembly.
- **Limitations:** Limited flexibility for changes in product types or customization.

Process Layout

- **Flexibility:** Suitable for producing a variety of products with different requirements.
- **Product Variety:** Facilitates easy adaptation for different types of production processes.
- **Limitations:** Can lead to longer transport times between processes and higher handling costs.

Hybrid Layout

- **Combination:** Merges the best features of both product and process layouts to achieve flexibility while maintaining efficiency.
- **Adaptability:** Allows production of both high-volume standardized products and customized goods.
- **Limitations:** Can be complex to design and manage due to varying requirements of different product types.

Fixed Position Layout

- **Large Products:** Ideal for large or bulky products that cannot be easily moved, such as large leather furniture or industrial footwear.
- **Space Requirements:** Requires significant space to accommodate the product and the movement of materials, tools, and workers.
- **Limitations:** Less efficient in terms of time and space compared to other layouts, as workers and materials must be moved to the product.

Layout Type	Flexibility	Efficiency	Product Variety	Volume	Material Movement	Typical Use
Product	Low	High	Low	High	Low	Mass prod. line
Process	High	Low	High	Low	High	Job shop
F. Position	High	Low	Very High	Very Low	High	Project manufacturing
Cellular	Medium	High	Medium	Medium	Medium	Modular production
Combination	Medium	High	Medium	Medium	Medium	Mixed product plants
Warehouse	Medium	High	N/A	N/A	Medium	Storage & logistics

1.3 Advantages and disadvantages of various line layouts.

Product Layout

Advantages:

- Efficiency: Best for high-volume production of standardized products.
- Reduced Handling: Minimal material movement between workstations, reducing handling time.
- Cost-effective: Streamlined production process leads to lower production costs per unit.

Disadvantages:

- Limited Flexibility: Difficult to switch between different product types or designs.
- Dependency: Any issue at one workstation can halt the entire production line.
- Increased Setup Time: Setting up for new products can be time-consuming and costly.

Process Layout

Advantages:

- Flexibility: Suitable for producing a variety of products, allowing customization.
- Adaptability: Can easily accommodate changes in product design or volume.
- Efficient for Small Batches: Best for low- to medium-volume production where product variety is high.

Disadvantages:

- Higher Handling Costs: Materials need to be transported between different departments, increasing time and cost.
- Longer Production Time: Movement between workstations may cause delays.
- Complex Management: Requires more coordination to manage different workstations effectively.

Hybrid Layout

Advantages:

- **Balanced Flexibility and Efficiency:** Combines the benefits of product and process layouts, suitable for both mass production and custom products.
- **Better Utilization:** Helps balance high-volume and low-volume production requirements.
- **Improved Workflow:** Allows for streamlined processes for standard products while maintaining flexibility for custom products.

Disadvantages:

- **Complex to Implement:** Difficult to design and manage, especially if production requirements frequently change.
- **Space and Resource Intensive:** Requires more space and resources to accommodate different production needs.
- **Increased Management Costs:** Requires more oversight and coordination between departments.

Fixed Position Layout

Advantages:

- **Ideal for Large Products:** Perfect for bulky or large products that are difficult to move, such as large leather goods or footwear.
- **Reduced Material Handling:** No need to move the product through various workstations.
- **Flexible:** Accommodates complex and large-scale projects, like custom leather products.

Disadvantages:

- **Space Requirements:** Requires large spaces to set up and move materials, tools, and workers.
- **Inefficiency:** Workstations may not be fully utilized, and production flow may not be smooth.
- **Higher Labor Costs:** Requires more labor to transport materials and tools to the product, increasing costs.

Self-check- 2.1

Short Questions:

1. **Question:** What is a product layout?
Answer:
2. **Question:** What is a process layout?
Answer:
3. **Question:** What is a hybrid layout?
Answer:
4. **Question:** What is a fixed position layout?
Answer:
5. **Question:** What are the advantages of a product layout?
Answer:
6. **Question:** What are the limitations of a process layout?
Answer:
7. **Question:** What are the benefits of a hybrid layout?
Answer:
8. **Question:** What are the disadvantages of a fixed position layout?
Answer:

Answer key – 2.1

Short Questions with Answers:

1. **Question:** What is a product layout?
Answer: A product layout arranges workstations and equipment in a sequence based on the steps required to produce a specific product, ideal for high-volume, standardized production.
2. **Question:** What is a process layout?
Answer: A process layout groups similar processes or machines together, allowing flexibility to handle different types of products with varying requirements.
3. **Question:** What is a hybrid layout?
Answer: A hybrid layout combines elements of both product and process layouts to achieve flexibility while maintaining efficiency for different types of products.
4. **Question:** What is a fixed position layout?
Answer: In a fixed position layout, the product remains stationary, and materials, labor, and equipment are brought to the product, ideal for large or bulky items.
5. **Question:** What are the advantages of a product layout?
Answer: Advantages include efficiency, reduced handling, and cost-effectiveness for high-volume production of standardized products.
6. **Question:** What are the limitations of a process layout?
Answer: Process layouts can lead to longer transport times, higher handling costs, and require more complex management due to the movement between departments.
7. **Question:** What are the benefits of a hybrid layout?
Answer: Benefits include balanced flexibility and efficiency, better utilization of resources, and improved workflow for both standard and custom products.
8. **Question:** What are the disadvantages of a fixed position layout?
Answer: Disadvantages include large space requirements, inefficiency in time and space, and higher labor costs for transporting materials to the product.

Task sheet- 2.1

Task Name: Assess Current Facility Layout and Recommend Improvement Opportunities.

Instructions:	
Read and understand the directions carefully: ▪ this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ this assessment activity will be used to measure your underpinning knowledge and skills ▪ you will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ you have two (2) hours to complete this demonstration.	
Working Procedure:	
▪ SOP: Select Section – Choose one production area to study. ▪ Document Layout – Sketch the current layout and equipment placement. ▪ Map Flow – Trace material and worker movement paths. ▪ Measure Distance – Record travel distances and handling points. ▪ Identify Issues – Note congestion, cross-flow, and idle zones. ▪ Propose Improvements – Suggest layout changes to reduce movement, time, and risk.	
Specific Information:	
▪ Collect materials: Facility layout plans, floor plans, and operational data. ▪ Review training materials on facility layout optimization and improvement strategies. ▪ Prepare workspace: Computers or tools for analyzing the layout and documenting recommendations. ▪ Involve relevant team members or stakeholders for input and observations. ▪ Assess the current facility layout for efficiency and workflow. ▪ Recommend improvement opportunities based on the analysis. ▪ Submit recommendations to the relevant authority or trainer for review.	
Resources Required:	
Tools and materials:	• Computer or laptop • Internet access • Stop watch • Video camera • Paper • Markers • Sticky note • Flip chart • Masking Tape

Information sheet-2.2

Learning outcome 2: Perform work study process.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 2.1 Work study process.
- 2.2 Method study.
- 2.3 Current work methods.
- 2.4 Time study.

2.1 Work study process.

The work study process involves analyzing and improving production methods to enhance efficiency, reduce costs, and optimize performance.

Time Study

Time study involves measuring the time required to complete a specific task or production process.

Key Benefits:

- Helps identify inefficient operations and delays.
- Provides data to establish standard times for tasks.
- Assists in setting productivity goals and improving workforce management.

Method Study

Method study focuses on analyzing and improving the way tasks are performed. It looks at the sequence of actions, tools, and techniques used in a process.

Key Benefits:

- Identifies unnecessary steps and wasteful activities.
- Helps simplify tasks and improve worker ergonomics.
- Reduces production costs and improves overall efficiency.

2.2 Method study.

Method study is a systematic approach to analyzing and improving the way tasks and processes are performed.

Key Steps in Method Study:

- a) **Select the Process:** Choose the specific task or process that needs improvement, typically one that is time-consuming or inefficient.
- b) **Record the Current Method:** Document the existing process by observing workers and taking notes on each step. This helps identify unnecessary steps or bottlenecks.
- c) **Examine the Process:** Analyze the recorded method to spot inefficiencies, waste, or areas for improvement. Consider factors such as tool usage, worker movement, and task sequencing.
- d) **Develop Improved Methods:** Propose alternative methods or modifications that simplify the process, eliminate waste, or reduce unnecessary movement. This could include changing the sequence of tasks, updating tools, or improving worker ergonomics.
- e) **Implement the New Method:** Introduce the improved method to the production process and ensure workers are trained on the new procedures.
- f) **Evaluate the Results:** Measure the success of the new method by comparing it to the original process in terms of time, efficiency, and quality.

2.3 Current work methods.

Current work methods refer to the existing processes and techniques used in the production area. These methods define how tasks are performed, the sequence of operations, and the tools and materials used in each step of the production process.

Key Aspects of Current Work Methods:

- a) **Task Sequence**
The order in which tasks are performed during production. A well-organized sequence ensures smooth flow and reduces unnecessary delays between steps.
- b) **Workstation Setup**
How tools, materials, and equipment are arranged at each workstation to maximize efficiency and minimize worker movement. An organized workspace improves productivity and reduces time wasted on finding tools or materials.
- c) **Worker Movements**
The movements made by workers while performing tasks. Excessive or unnecessary movements can increase time and effort, reducing overall efficiency.
- d) **Tool and Equipment Usage**
The tools and machines used in each stage of production. Using outdated or inappropriate tools can slow down the process, leading to inefficiencies.

e) **Work Practices**

The specific methods and techniques workers use to perform their tasks. These practices are often influenced by training, experience, and established procedures.

2.4 Time study.

Time study is a technique used to measure the time required to perform a specific task or process. It helps identify areas for improvement and establishes benchmarks for efficient production.

Manual Time Study

In a manual time study, the observer records the time taken to perform each task or operation using a stopwatch.

Key Benefits:

- Simple and cost-effective.
- Provides direct data on task durations.
- Ideal for tasks that are consistent and repetitive.

Stopwatch Time Study

A stopwatch time study is a more focused version of manual time study, where the observer uses a stopwatch to measure how long it takes to perform each step in the process. This method often involves multiple observations of the task to calculate an average time.

Key Benefits:

- Accurate time measurements for each task step.
- Useful for tasks with consistent timing.
- Helps set standards for efficient performance.

Pre-determined Motion Time System (PMTS)

PMTS involves using standardized time values for basic motions or elements, such as reaching, lifting, or turning, based on pre-determined data. It helps estimate the time required for tasks without actually observing the process.

Key Benefits:

- No need for direct observation or a stopwatch.
- Can be used for tasks that are difficult to time directly.
- Helps quickly set time standards for new or complex tasks.

Self-check - 2.2

Short Questions:

1. **Question:** What is the work study process?
Answer:

2. **Question:** What is time study?
Answer:

3. **Question:** What is method study?
Answer:

4. **Question:** What are the key benefits of time study?
Answer:

5. **Question:** What are the key steps in method study?
Answer:

6. **Question:** What are current work methods?
Answer:

Answer Key - 2.2

Short Questions with Answers:

1. **Question:** What is the work study process?

Answer: The work study process involves analyzing and improving production methods to enhance efficiency, reduce costs, and optimize performance.

2. **Question:** What is time study?

Answer: Time study involves measuring the time required to complete a specific task or production process to identify inefficiencies and set productivity goals.

3. **Question:** What is method study?

Answer: Method study focuses on analyzing and improving the way tasks are performed by examining the sequence of actions, tools, and techniques used.

4. **Question:** What are the key benefits of time study?

Answer: Time study helps identify inefficient operations, provides data to establish standard times, and assists in setting productivity goals.

5. **Question:** What are the key steps in method study?

Answer: The key steps are: select the process, record the current method, examine the process, develop improved methods, implement the new method, and evaluate the results.

6. **Question:** What are current work methods?

Answer: Current work methods refer to the existing processes, task sequences, workstation setup, and tool usage in production that define how tasks are performed.

Task Sheet- 2.2

Task Name: Calculate SMV for Two Stitching and Two Assembly Operations.

Instructions:	
Read and understand the directions carefully: - this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. - this assessment activity will be used to measure your underpinning knowledge and skills - you will have fifteen (15) minutes to familiarize yourself with the resources to be used - you have two (2) hours to complete this demonstration.	
Working Procedure:	
- Select Operations – Choose 2 stitching and 2 assembly tasks. - Observe Method – Watch each operation to confirm the standard work sequence. - Time Study – Record at least 5 cycle times per operation using a stopwatch. - Calculate Average Time – Compute the mean cycle time for each operation. - Apply Allowances – Add fatigue, personal, and delay allowances as per standard. - Determine SMV – Convert total time into Standard Minute Value for each operation. - Review & Validate – Share results and assumptions with the trainer for approval.	
Specific Information:	
- Collect required materials: Time data for each stitching and assembly operation. - Review training materials on SMV calculation methods. - Prepare workspace: Use a calculator or software for performing calculations. - Obtain time data: Get the time taken for each stitching and assembly operation (in seconds or minutes). - Calculate SMV: For each operation, use the formula - Calculate total SMV: Add the SMVs for both stitching and both assembly operations. - Submit findings: Provide the total SMV to the relevant authority or trainer for review.	
Resources Required:	
Tools and materials:	- Computer or laptop - Internet access - Stop watch - Video camera - Paper - Markers - Sticky note - Flip chart - Masking Tape

Information Sheet - 2.3

Learning outcome -3: Prepare skills matrix for production line.

Learning objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 3.1 Skills variables.
- 3.2 Skill weights based on task importance and complexity.
- 3.3 Skill levels and grades according to standards.
- 3.4 Multi-skilled criteria.
- 3.5 Skills matrix.

3.1 Skills variables.

Standard time: The time an operator takes to complete a task compared to the defined SMV or standard cycle time.

Quality: The percentage of defect-free work produced by the operator according to SOP and quality standards.

3.2 Skill weights based on task importance and complexity.

Skill Weights are numerical values assigned to each skill variable to reflect how critical and complex a task is within a production process. They determine the relative impact of Standard Time (Speed/Efficiency) and Quality (Accuracy/Compliance) on the overall performance score of an operator.

Example:

Standard Time Weight = **60%** and Quality Weight = **40%**

This means **efficiency is more critical than accuracy** for this task, while quality still has a strong impact on the final score.

3.3 Skill levels and grades according to standards.

Skill Levels and Grades classify operators based on their ability to perform tasks consistently within Standard Time (SMV) and Quality Standards.

Level	Grade	Title
L1	D	Beginner / Trainee
L2	C	Basic Operator

3.4 Multi-skilled criteria.

A Multi-Skilled Operator is an employee who is certified to perform multiple operations across different workstations or processes while consistently meeting Standard Time (SMV) and Quality Standards.

Example:

- Validated in minimum 4 different operations
- Must include at least one critical/complex operation

3.5 Skills matrix.

A Skills Matrix is a structured visual tool that maps operators against specific operations and required skill levels, showing who is trained, certified, and capable of performing each task.

Operator Name	Op-1: Cutting	Op-2: Stitching	Op-3: Assembly	Op-4: Finishing	Op-5: QC	Grade	Multi-Skilled (Y/N)
A. Rahman	2	3	2	1	2	A	Y
S. Islam	1	2	1	2	1	B	N
M. Hossain	3	3	2	2	2	A+	Y

Self-check- 2.3

Short Questions:

1. **Question:** What is a Skills Matrix?

Answer:

2. **Question:** Why is a Skills Matrix used in production?

Answer:

3. **Question:** How often should a Skills Matrix be updated?

Answer:

4. **Question:** How does a Skills Matrix help quality control?

Answer:

5. **Question:** What information is usually shown in a Skills Matrix?

Answer:

6. **Question:** How does a Skills Matrix support training plans?

Answer:

Answer Key -2.3

Short Questions with Answers:

1. **Question:** What is a Skills Matrix?

Answer: A visual tool that maps operators against operations to show training, certification, and skill levels.

2. **Question:** Why is a Skills Matrix used in production?

Answer: To support line balancing, manpower planning, and identifying training gaps.

3. **Question:** How often should a Skills Matrix be updated?

Answer: Weekly or after any training, certification, or role change.

4. **Question:** How does a Skills Matrix help quality control?

Answer: It ensures critical operations are assigned to certified or advanced operators.

5. **Question:** What information is usually shown in a Skills Matrix?

Answer: Operator name, operations, skill level, grade, and multi-skill status.

6. **Question:** How does a Skills Matrix support training plans?

Answer: It highlights low-skill areas and helps prioritize targeted training programs

Task Sheet- 2.3

Task Name: Evaluate Operator Skills Against Defined SOP Standards (5 Operators)

Instructions:	
Read and understand the directions carefully: ▪ this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ this assessment activity will be used to measure your underpinning knowledge and skills ▪ you will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ you have two (2) hours to complete this demonstration.	
Working Procedure: ● Select Operators – Choose any 5 operators for assessment. ● Review SOP – Study the standard operating procedure and quality criteria. ● Explain Task – Brief operators on the operation and expected method. ● Observe Performance – Watch each operator perform the task step-by-step. ● Score Skill Levels – Rate method adherence, speed, quality, and safety. ● Record Gaps – Note deviations, errors, or training needs. ● Review & Feedback – Share results and improvement tips with the trainer/operators.	
Specific Information: ▪ Collect operation list of the organization ▪ Review and understand the SOP for skill evaluation criteria ▪ Use a stopwatch/video camera & Quality standard during data collection ▪ Calculate skill level & grade base on defined standard ▪ Provide the total Skill evaluation result to the relevant authority or trainer for review.	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note ● Flip chart ● Masking Tape

Information sheet-2.4

Learning outcome -4: Implement line balancing in production.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 4.1 Principles and objectives
- 4.2 Work tasks and process steps are analyzed
- 4.3 Standard line balancing methods
- 4.4 Idle time and bottlenecks
- 4.5 Line balancing results

4.1 Principles and objectives

- Distribute work evenly across all operators to avoid bottlenecks and idle time.
- Maximize line efficiency by reducing waste, delays, and unnecessary movement.
- Maintain smooth and continuous flow of materials between workstations.
- Balance operations to consistently meet takt time and production targets.
- Optimize use of labor, machines, and skills to improve overall productivity.

4.2 Work tasks and process steps are analyzed

Work tasks and process steps are carefully reviewed to identify inefficiencies and gaps. Each operation is mapped and timed to ensure proper sequencing and balanced workload across the line.

4.3 Standard line balancing methods

Standard-based (SMV): Uses predetermined standard minute values to assign tasks, plan manpower, and estimate expected output under standard conditions.

Real-time-based (Cycle Time): Uses actual measured operation times from the line to dynamically adjust task allocation and improve flow and bottleneck control.

4.4 Idle time and bottlenecks

Idle Time: The period when operators or machines are waiting without work due to imbalance, delays, or lack of material flow.

Bottlenecks: Workstations or processes with the longest cycle time that restrict overall line output and cause work-in-progress buildup.

4.5 Line balancing results

Line balancing results refer to the measurable improvements achieved after redistributing tasks and resources to ensure smooth workflow, reduced idle time, and consistent output across all workstations.

Example: After reassigning a 1.5-minute operation from an overloaded stitching station to a nearby operator, the line output increased from 80 to 100 pieces per hour and waiting time between processes was eliminated.

Self -Check -2.4

Short Questions:

1. **Question:** What is line balancing?
Answer:

2. **Question:** What is the main objective of line balancing?
Answer:

3. **Question:** What is a bottleneck?
Answer:

4. **Question:** Why is workload balancing important?
Answer:

5. **Question:** What is standard-based line balancing?
Answer:

6. **Question:** What is real-time-based line balancing?
Answer:

7. **Question:** What is line efficiency?
Answer:

8. **Question:** How can bottlenecks be reduced?
Answer:

9. **Question:** What is the result of good line balancing?
Answer:

Answer Key- 2.4

Short Questions with Answers:

1. **Question:** What is line balancing?
Answer: Line balancing is the process of distributing work evenly among operators or workstations to achieve smooth flow and maximum efficiency.
2. **Question:** What is the main objective of line balancing?
Answer: To minimize idle time and bottlenecks while meeting production targets.
3. **Question:** What is a bottleneck?
Answer: A bottleneck is a workstation that limits overall line output due to having the longest processing time.
4. **Question:** Why is workload balancing important?
Answer: It helps maintain consistent output and reduces operator fatigue and delays.
5. **Question:** What is standard-based line balancing?
Answer: It uses SMV to assign tasks and plan manpower under standard conditions.
6. **Question:** What is real-time-based line balancing?
Answer: It uses actual cycle time data to adjust task allocation dynamically.
7. **Question:** What is line efficiency?
Answer: Line efficiency is the percentage of productive time compared to total available time.
8. **Question:** How can bottlenecks be reduced?
Answer: By redistributing tasks, adding support operators, or improving machine performance.
9. **Question:** What is the result of good line balancing?
Answer: Improved productivity, reduced WIP, and better utilization of labor and machines.

Task Sheet -2.4

Task Name: Calculate Line Balancing Rate / Ratio for a Stitching or Production Line

Instructions:	
Read and understand the directions carefully: ▪ this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ this assessment activity will be used to measure your underpinning knowledge and skills ▪ you will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ you have two (2) hours to complete this demonstration.	
Working Procedure:	
▪ Select Line – Choose the stitching or production line to analyze. ▪ List Operations – Document all operations and assigned operators. ▪ Collect Cycle Times – Record or use standard times for each operation. ▪ Identify Bottleneck Time – Determine the longest operation time on the line. ▪ Calculate Total Work Content – Sum all operation times. ▪ Compute Balance Rate / Ratio – Apply the line balancing formula to determine efficiency. ▪ Review & Improve – Highlight imbalances and suggest workload redistribution.	
Specific Information:	
▪ Product style, size range, and operation breakdown. ▪ Standard Minute Value (SMV) for each process. ▪ Target output and working hours. ▪ Operator skill levels and machine availability. ▪ Line layout, material flow, and quality checkpoints.	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note ● Flip chart ● Masking Tape

Information sheet-2.5

Learning outcome -5: Develop value stream mapping.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 5.1 Concept and purpose of Value Stream Mapping (VSM)
- 5.2 Appropriate VSM level
- 5.3 Material flow, information flow, and process time.
- 5.4 Areas for improvement.

5.1 Concept and purpose of Value Stream Mapping (VSM)

Value Stream Mapping (VSM) is a Lean manufacturing and process improvement tool used to visually map the entire flow of materials and information required to deliver a product or service—from raw material to customer delivery.

5.2 Appropriate VSM level

Current State VSM: In Value Stream Mapping (VSM), Current Production Processes refer to the “Current State”—a visual representation of how materials and information actually flow today from order receipt to product delivery.

Future State VSM: It is a designed view of how your production system should operate after Lean improvements. It removes waste from the Current State and creates a smooth, pull-based flow that aligns production with customer demand.

It is not an idealistic sketch—it is a **realistic target model** based on achievable improvements, standard work, and management systems.

5.3 Material flow, information flow, and process time.

Material Flow Data (What Moves & Where It Waits) : This shows how physical items move through the system.

Information Flow Data (What Triggers Work): This shows how production is planned, scheduled, and controlled.

Process Time Data (How Long Work Takes): This measures how efficiently each operation runs.

5.4 Areas for improvement are identified

Bottlenecks (Flow Constraints)

- Process steps where Cycle Time (CT) > Takt Time
- Long queues of WIP before a workstation

Excess Work-in-Process (WIP)

- Large inventory triangles between processes
- Long waiting times on the timeline

Long Lead Time

- High Non-Value-Added Time (NVA) vs Value-Added Time (VA)

Information Flow Gaps

- Delays between planning and production
- Manual or unclear communication methods

Quality Losses & Rework Loops

- Defects detected only at end-line
- Rework arrows looping back to earlier processes

Changeover & Downtime Losses

- High changeover time (C/O) in process boxes
- Low machine uptime %

Self -Check -2.5

Short Questions:

1. **Question:** What is the main purpose of identifying improvement areas in a VSM?
Answer:

2. **Question:** How is excess WIP identified in a VSM?
Answer:

3. **Question:** What type of waste is shown by long waiting times in a VSM timeline?
Answer:

4. **Question:** How does VSM help improve information flow?
Answer:

5. **Question:** How can quality losses be identified in a VSM?
Answer:

6. **Question:** How does VSM help reduce lead time?
Answer:

7. **Question:** What is the final outcome of identifying improvement areas in VSM?
Answer:

Answer Key- 2.5

Short Questions with Answers:

1. **Question:** What is the main purpose of identifying improvement areas in a VSM?
Answer: To eliminate waste, improve flow, reduce lead time, and increase overall process efficiency.
2. **Question:** How is excess WIP identified in a VSM?
Answer: By large inventory symbols and long waiting times between process steps.
3. **Question:** What type of waste is shown by long waiting times in a VSM timeline?
Answer: Non-value-added time or waiting waste.
4. **Question:** How does VSM help improve information flow?
Answer: It shows delays and gaps in communication between planning and production.
5. **Question:** How can quality losses be identified in a VSM?
Answer: By rework loops and defect detection points shown on the map.
6. **Question:** How does VSM help reduce lead time?
Answer: By identifying and removing non-value-added steps and delays in the process.
7. **Question:** What is the final outcome of identifying improvement areas in VSM?
Answer: The creation of a realistic and efficient Future State Value Stream Map.

Task Sheet - 2.5

Task Name: Draw Current & Future State VSM of a Stitching / Assembly Line.

Instructions:	
Read and understand the directions carefully: - this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. - this assessment activity will be used to measure your underpinning knowledge and skills - you will have fifteen (15) minutes to familiarize yourself with the resources to be used - you have two (2) hours to complete this demonstration.	
Working Procedure:	
- Select Line – Choose the stitching or assembly line to study. - Map Current State – Draw all process steps, material flow, and information flow. - Collect Data – Record cycle time, changeover time, WIP, and lead time at each step. - Identify Waste & Bottlenecks – Mark delays, excess inventory, and constraints. - Define Future Improvements – Propose flow, balance, and layout enhancements. - Draw Future State Map – Redesign the process with reduced waste and smoother flow. - Review & Validate – Present both maps to the trainer for feedback and approval.	
Specific Information:	
- Process Data Boxes: Capture CT, C/O time, number of operators, uptime %, batch size - Material Flow Details: Show process sequence, WIP levels, inventory points, and transport method. - Information Flow: Identify how orders, schedules, and feedback move (ERP, Excel, boards, push or pull system). - Timeline & Lead Time: Separate value-added and non-value-added time to calculate total lead time. - Standard Symbols & Legend: Use consistent VSM icons for processes, inventory, arrows, Kanban, and Kaizen bursts. - Improvement Targets: Mark bottlenecks, WIP reduction goals, quality targets, and responsible owner with due dates.	
Resources Required:	
Tools and materials:	- Computer or laptop - Internet access - Stop watch - Video camera - Paper - Markers - Sticky note - Flip chart - Masking Tape

Information sheet-2.6

Learning outcome -6: Prepare efficiency report.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 6.1 Overall Equipment Effectiveness (OEE)
- 6.2 Overall Working Efficiency (OWE)
- 6.3 Identify performance gaps and improvement areas.
- 6.4 Reports

6.1 Overall Equipment Effectiveness (OEE)

OEE shows how much of the planned production time is actually productive and producing good-quality products at the right speed.

1. Availability
Measures how much time the machine was running vs. planned time.
$\text{Availability} = \frac{\text{Operating Time}}{\text{Planned Production Time}}$
2. Performance
Measures if the machine is running at the correct speed.
$\text{Performance} = \frac{\text{Ideal Cycle Time} \times \text{Total Output}}{\text{Operating Time}}$
3. Quality
Measures how many good products were made.
$\text{Quality} = \frac{\text{Good Units}}{\text{Total Units Produced}}$

$$\text{OEE} = \text{Availability} \times \text{Performance} \times \text{Quality}$$

6.2 Overall Working Efficiency (OWE)

Overall Working Efficiency (OWE) is a performance metric used to measure how efficiently a production line, team, or workforce is utilizing available working time to produce output compared to the standard or target.

$$\text{OWE} = \frac{\text{Standard Minutes Earned (SMV} \times \text{Output)}}{\text{Available Working Minutes}} \times 100$$

6.3 Identify performance gaps and improvement areas.

- Compare actual performance with targets and standards.
- Identify losses from downtime, low speed, and defects.
- Analyze root causes using production and quality data.
- Prioritize high-impact gaps and bottlenecks.
- Implement corrective and improvement actions.

6.4 Reports

Manual (Spreadsheet): This method uses a spreadsheet to enter production time, output, and defects manually. Simple formulas are applied to calculate efficiency, OEE, and OWE, and basic charts are used to show performance and problem areas.

Software: This method uses software to collect production and machine data automatically. The system calculates efficiency in real time and creates ready-made reports and dashboards to quickly see performance and improvement areas.

Self -Check -2.6

Short Questions:

1. **Question:** What is efficiency in production?

Answer:

2. **Question:** What does OEE stand for?

Answer:

3. **Question:** What are the three components of OEE?

Answer:

4. **Question:** What is Availability in OEE?

Answer:

5. **Question:** What is OWE?

Answer:

6. **Question:** What is the formula for OWE?

Answer:

7. **Question:** Why is efficiency reporting important?

Answer:

8. **Question:** What is the benefit of using software for efficiency reports?

Answer:

Answer Key- 2.6

Short Questions with Answers:

1. **Question:** What is efficiency in production?

Answer: Efficiency is the measure of how well resources like time, labor, and machines are used to produce the required output.

2. **Question:** What does OEE stand for?

Answer: OEE stands for Overall Equipment Effectiveness.

3. **Question:** What are the three components of OEE?

Answer: Availability, Performance, and Quality.

4. **Question:** What is Availability in OEE?

Answer: Availability measures the percentage of planned time that the machine is actually running.

5. **Question:** What is OWE?

Answer: OWE stands for Overall Working Efficiency.

6. **Question:** What is the formula for OWE?

Answer: $OWE = (\text{Actual Output} \div \text{Standard Output}) \times 100$.

7. **Question:** Why is efficiency reporting important?

Answer: It helps identify performance gaps, reduce waste, and improve productivity.

8. **Question:** What is the benefit of using software for efficiency reports?

Answer: It saves time, reduces errors, and provides real-time performance tracking and automatic reports.

Task Sheet - 2.6

Task Name: Calculate OWE & OEE for Five Production Lines (10 Working Days Data)

Instructions:	
Read and understand the directions carefully: ▪ this practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ this assessment activity will be used to measure your underpinning knowledge and skills ▪ you will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ you have two (2) hours to complete this demonstration.	
Working Procedure:	
▪ Select Lines – Identify 5 production lines for evaluation. ▪ Collect Data – Gather 10 days of planned time, downtime, output, defects, and manpower data. ▪ Calculate Availability – Determine operating time versus planned production time. ▪ Calculate Performance – Compare actual output to standard or target output. ▪ Calculate Quality Rate – Compute good output versus total output. ▪ Compute OEE & OWE – Apply formulas to determine efficiency and workforce effectiveness. ▪ Review & Benchmark – Compare results across lines and highlight improvement opportunities.	
Specific Information:	
▪ Production Data – Planned working time, actual working time, and total output. ▪ Machine Data – Downtime, breakdowns, and maintenance records. ▪ Quality Data – Good units, defective units, and rework quantity. ▪ Standard Time (SMV) – Standard minutes per operation or product. ▪ Manpower Details – Number of operators and working hours. ▪ Report Format – Summary tables, charts, and improvement action plan.	
Resources Required:	
Tools and materials:	• Computer or laptop • Internet access • Stop watch • Video camera • Paper • Markers • Sticky note • Flip chart • Masking Tape

Module-3

Module: Applying Lean Manufacturing Techniques

Unit Code: SICIP-LET-IPI-03-O

**Skills for Industry Competitiveness and Innovation Program (SICIP)
Finance Division, Ministry of Finance**

Module–3

Module Title: Applying Lean Manufacturing Techniques.

Unit Code: SICIP-LET-IPI-3-O

Nominal Hours: 40 hrs.

Module Descriptions: This module covers the skills, knowledge and attitudes required to apply lean manufacturing techniques. It specifically includes the tasks of identifying 3M (muda, muri and mura), identifying seven types of waste in production process, applying 5S techniques in workplace, implementing lean tools and implementing continuous improvement (KAIZEN) activities.

Learning Outcome:

1. Identify 3M (muda, muri and mura)
2. Identify the seven types of waste in production process
3. Apply 5S techniques in workplace.
4. Implement lean tools
5. Implement continuous improvement (Kaizen) activities.

Assessment Criteria:

1. Activities causing Muda (waste) in the production process are identified and documented.
2. Tasks leading to Muri (overburden) on workers or machines are detected and recorded.
3. Variations and inconsistencies causing Mura (unevenness) in workflow are recognized.
4. Observations are compared with standard operating practices.
5. Seven types of waste in the production process are identified and listed.
6. Each type of waste is observed in the workflow and documented.
7. Causes of waste in materials, time, and labor are recognized.
8. Instances of defects and rework are detected and recorded.
9. Waste related to transportation, motion, and inventory is analyzed.
10. Workplace is organized according to the 5S principles.
11. Unnecessary items are removed and sorted from the work area.
12. Tools and materials are arranged in designated locations for easy access.
13. Workstations are cleaned and maintained regularly.
14. Standard procedures for organization and cleanliness are implemented.
15. 5S practices are monitored and deviations are corrected.
16. Lean tools are implemented in the production process according to requirements.
17. Just-in-Time techniques are applied and monitored.
18. Jidoka principles are applied in the workflow.
19. Production activities are aligned with lean principles to reduce waste and improve efficiency.
20. Deviations from lean practices are identified and corrective measures are documented.
21. Implementation results are reviewed against productivity and quality targets.
22. Kaizen activities are implemented in the workplace to improve processes.
23. Improvement opportunities are identified through observation and feedback.
24. Small, incremental changes are applied to enhance efficiency and quality.
25. Results of improvement actions are measured and documented.
26. Employees are involved in suggesting and implementing improvements.
27. Outcomes of Kaizen activities are reviewed against performance targets.

Information Sheet – 3.1

Learning Outcome-1: Identify 3M (muda, muri and mura).

Learning Objectives: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 3.1 Activities causing Muda (waste) in the production process.
- 3.2 Tasks leading to Muri (overburden) on workers or machines.
- 3.3 Variations and inconsistencies causing Mura (unevenness) in workflow.

3.1 Activities causing Muda (waste) in the production process.

Muda, a Japanese term for waste, refers to any activity that consumes resources without adding value to the final product.



An activity within a process that **does not add value** from the perspective of customer.

Overproduction

Producing more goods than needed or before they are required leads to excess inventory, which ties up resources and increases storage costs.

Waiting

Idle time occurs when workers, machines, or materials are waiting for the next step in production. Delays in one part of the process can affect the entire workflow.

Transport

Excessive movement of materials between workstations or warehouses increases handling time and can cause damage to materials, leading to waste.

Overprocessing

Doing more work than required or using overly complex methods results in wasted time and effort.

Inventory

Holding excess inventory increases storage costs and the risk of obsolescence. It can also tie up capital that could be better used elsewhere in production.

Defects

Reworking or discarding defective products is a major source of waste. It requires additional labor, materials, and time to fix mistakes that could have been avoided with better quality control.

Motion

Unnecessary movement by workers, such as walking long distances to get tools or materials, leads to lost time and effort.

Unutilized Talent

Failing to use the full potential of employees, such as not leveraging their skills or ideas, leads to missed opportunities for process improvements.

3.2 Tasks leading to Muri (overburden) on workers or machines.

Muri, a Japanese term for overburden, refers to placing excessive strain on workers or machines. Overburden can lead to fatigue, errors, equipment breakdowns, and reduced efficiency.



- a. Excessive Workload on Workers
- b. High Production Speed Demands
- c. Poor Machine Maintenance
- d. Lack of Proper Tools or Equipment
- e. Frequent Task Switching
- f. Unnecessary Overtime
- g. High Complexity in Tasks

3.3 Variations and inconsistencies causing Mura (unevenness) in workflow.

Mura, a Japanese term for unevenness, refers to fluctuations or inconsistencies in production that can cause inefficiency, delays, and waste.



- a. Fluctuating Production Speed
- b. Irregular Workload Distribution
- c. Variability in Machine Performance
- d. Supply Chain Interruptions
- e. Inconsistent Worker Performance
- f. Quality Control Variations
- g. Unpredictable Demand
- h. Inconsistent Material Handling

Self-Check – 3.1

Short Questions:

1. **Question:** What is Muda?
Answer:
2. **Question:** What causes overproduction in manufacturing?
Answer:
3. **Question:** How does waiting create waste in production?
Answer:
4. **Question:** What is the impact of excessive transport in production?
Answer:
5. **Question:** What is overprocessing in production?
Answer:
6. **Question:** How does holding excess inventory create waste?
Answer:
7. **Question:** What leads to defects in production?
Answer:
8. **Question:** What is unnecessary motion in production?
Answer:

Answer Key-3.1

Short Questions with Answers:

1. **Question:** What is Muda?
Answer: Muda is a Japanese term for waste, referring to any activity that consumes resources without adding value to the final product.
2. **Question:** What causes overproduction in manufacturing?
Answer: Overproduction occurs when more goods are produced than needed or before they are required, leading to excess inventory and increased storage costs.
3. **Question:** How does waiting create waste in production?
Answer: Waiting leads to idle time when workers, machines, or materials are waiting for the next step in production, affecting the entire workflow.
4. **Question:** What is the impact of excessive transport in production?
Answer: Excessive transport of materials between workstations or warehouses increases handling time, causes potential damage to materials, and wastes resources.
5. **Question:** What is overprocessing in production?
Answer: Overprocessing happens when more work is done than required, or overly complex methods are used, resulting in wasted time and effort.
6. **Question:** How does holding excess inventory create waste?
Answer: Excess inventory increases storage costs, the risk of obsolescence, and ties up capital that could be better used in production.
7. **Question:** What leads to defects in production?
Answer: Defects arise from poor quality control, requiring reworking or discarding products, which consumes labor, materials, and time.
8. **Question:** What is unnecessary motion in production?
Answer: Unnecessary motion occurs when workers perform actions like walking long distances to get tools or materials, wasting time and energy.

Task Sheet – 3.1

Task Name: Observe the production floor and identify at least two examples each of MURA (unevenness), and MURI (overburden) in every section.

Instructions:	
Read and understand the directions carefully:	
▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have two (2) hours to complete this demonstration.	
Working Procedure:	
▪ Get permission from the line supervisor. ▪ Visit each section (Cutting, Stitching, Assembly/Finishing). ▪ Observe material, operator, and machine flow. ▪ MURI (overburden), MURA (unevenness) examples. ▪ Record location and description of each finding. ▪ Suggest one improvement for each issue. ▪ Review and submit the assignment.	
Specific Information:	
▪ Follow all safety rules and PPE requirements while on the production floor. ▪ Observe actual work processes only (no assumptions or guesses). ▪ Record the exact location and operation name for every finding. ▪ Use clear, simple, and factual descriptions (no personal opinions). ▪ Do not interrupt operators or machines during observation. ▪ Maintain confidentiality of production data (no photos or sharing without approval).	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note ● Flip chart ● Masking Tape

Information Sheet – 3.2

Learning Outcome – 2: Identify the seven types of waste in production process.

Learning Objectives: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 2.1 Seven types of waste in the production process.
- 2.2 Causes of waste in materials, time, and labor.
- 2.3 Instances of defects and rework.
- 2.4 Waste related to transportation, motion, and inventory.

2.1 Seven types of waste in the production process.

In lean manufacturing, "waste" refers to activities or processes that do not add value to the final product.



Transportation

Unnecessary movement of materials, products, or information between processes or workstations leads to wasted time and energy.

Inventory

Excess inventory results in storage costs, potential obsolescence, and the risk of overproduction.

Motion

Unnecessary movement of workers or tools (e.g., walking long distances or searching for tools) wastes time and effort.

Waiting

Waiting occurs when workers, machines, or materials are idle, often due to delays in preceding processes.

Overproduction

Producing more products than needed or before they are required leads to excess inventory and unnecessary processing.

Overprocessing

Performing more work than necessary or using complex methods when simpler alternatives would suffice causes overprocessing waste.

Defects

Defective products require rework, repair, or scrapping, leading to wasted materials, time, and labor.

2.2 Causes of waste in materials, time, and labor.

Waste in materials, time, and labor can arise from various inefficiencies throughout the production process.

- **Poor Planning**
- **Machine Downtime**
- **Operator Errors**
- **Skill Gaps**
- **Layout Inefficiencies**
- **Material Shortage**

2.3 Instances of defects and rework.

Defects and rework are significant sources of waste in production. Addressing the root causes of defects and minimizing rework helps improve product quality, reduce costs, and enhance overall efficiency.

- **Material Defects**
- **Incorrect Machine Settings**
- **Human Error**
- **Inconsistent Quality Control**
- **Poor Workmanship**
- **Design or Specific Changes**
- **Inadequate Testing or Inspection**

2.4 Waste related to transportation, motion, and inventory.

Waste related to transportation, motion, and inventory refers to inefficiencies in how materials, workers, and products are managed throughout the production process.

Waste Related to Transportation

- **Example:** Moving leather pieces back and forth between workstations instead of organizing a smoother flow.
- **Solution:** Optimize the layout of workstations to minimize unnecessary transportation, use conveyor systems, and improve material flow.

Waste Related to Motion

- **Example:** Workers having to walk across the facility to get tools or materials, causing downtime and fatigue.
- **Solution:** Organize workstations efficiently, provide tools within easy reach, and eliminate unnecessary steps in the process.

Waste Related to Inventory

Excess inventory leads to storage costs, material obsolescence, and the potential for damage. Insufficient inventory can cause production delays, as workers wait for materials.

Self-Check – 3.2

Short Questions:

1. **Question:** What does waste refer to in lean manufacturing?
Answer:
2. **Question:** What is transportation waste?
Answer:
3. **Question:** How does excess inventory lead to waste?
Answer:
4. **Question:** What is motion waste?
Answer:
5. **Question:** How does waiting contribute to waste in production?
Answer:
6. **Question:** What causes overproduction waste?
Answer:
7. **Question:** What is overprocessing waste?
Answer:
8. **Question:** How do defects lead to waste?
Answer:

Answer Key – 3.2

Short Questions with Answers:

1. **Question:** What does waste refer to in lean manufacturing?
 Answer: In lean manufacturing, waste refers to activities or processes that do not add value to the final product.
2. **Question:** What is transportation waste?
 Answer: Transportation waste occurs when materials, products, or information are unnecessarily moved between processes or workstations, wasting time and energy.
3. **Question:** How does excess inventory lead to waste?
 Answer: Excess inventory results in storage costs, the risk of obsolescence, and the potential for overproduction.
4. **Question:** What is motion waste?
 Answer: Motion waste happens when workers or tools move unnecessarily, such as walking long distances or searching for tools, wasting time and effort.
5. **Question:** How does waiting contribute to waste in production?
 Answer: Waiting occurs when workers, machines, or materials are idle, often due to delays in preceding processes, causing inefficiency and downtime.
6. **Question:** What causes overproduction waste?
 Answer: Overproduction waste occurs when more products are made than needed or before they are required, leading to excess inventory and unnecessary processing.
7. **Question:** What is overprocessing waste?
 Answer: Overprocessing waste occurs when more work is done than necessary, or when complex methods are used instead of simpler alternatives.
8. **Question:** How do defects lead to waste?
 Answer: Defective products require rework, repair, or scrapping, leading to wasted materials, time, and labor.

Task Sheet - 3.2

Task Name: Visit each production section and record practical examples of the 7 wastes observed during operations.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have two (2) hours to complete this demonstration.	
Working Procedure: ▪ Get permission from the line supervisor. ▪ Visit each section (Cutting, Stitching, Assembly/Finishing). ▪ Observe material, operator, and machine flow. ▪ Identify MUDA (waste) examples. ▪ Record location and description of each finding. ▪ Suggest one improvement for each issue. ▪ Review and submit the assignment	
Specific Information: ▪ Follow all safety rules and PPE requirements while on the production floor. ▪ Observe actual work processes only (no assumptions or guesses). ▪ Record the exact location and operation name for every finding. ▪ Use clear, simple, and factual descriptions (no personal opinions). ▪ Do not interrupt operators or machines during observation. ▪ Maintain confidentiality of production data (no photos or sharing without approval).	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note ● Flip chart ● Masking Tape

Information Sheet - 3.3

Learning Outcome -3: Apply 5S techniques in workplace.

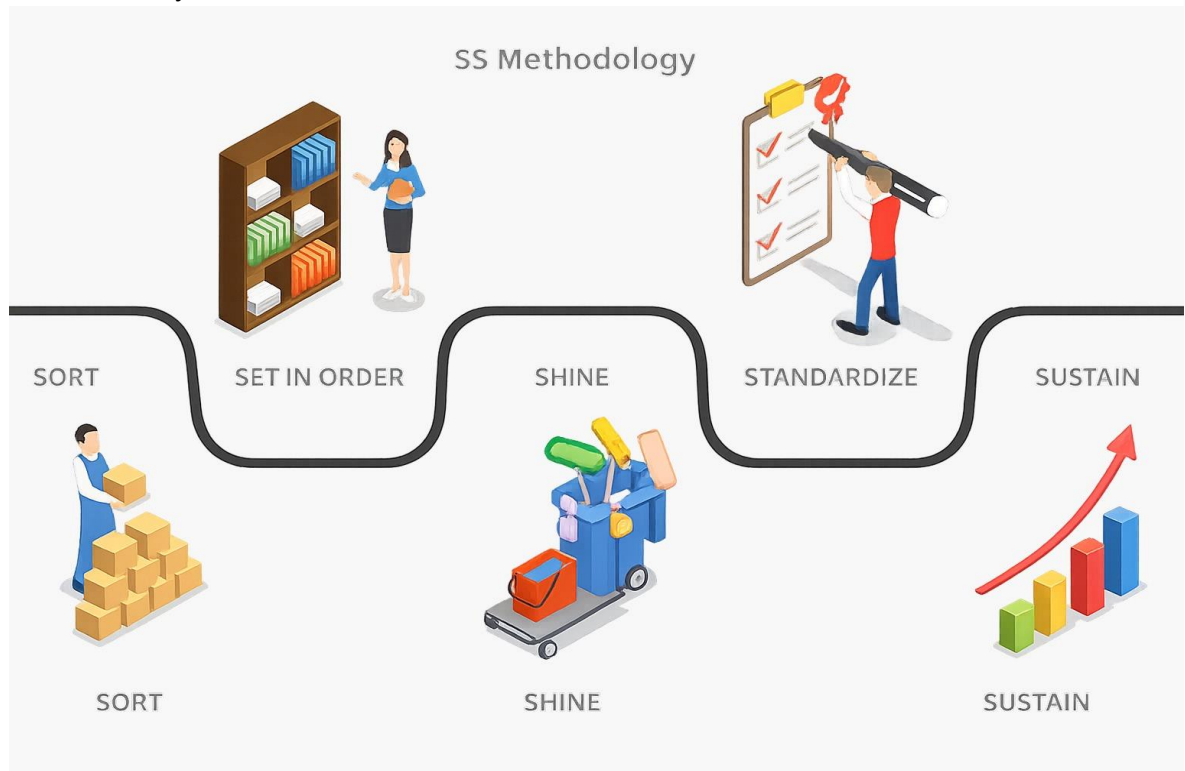
Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 3.1 5S principles.
- 3.2 Standard procedures for organization and cleanliness.

3.1 5S principles.

The 5S principles are a set of practices aimed at improving workplace organization, safety, and efficiency.



- **Sort**
Sorting involves removing unnecessary items from the workspace. This helps to declutter the area.
- **Set in Order**
Setting in order means organizing materials and tools in a way that makes them easy to find and access.
- **Shine**
Shining refers to maintaining cleanliness in the workplace. Regular cleaning of workstations, equipment, and tools.
- **Standardize**
Standardizing involves establishing consistent practices for organizing, cleaning, and maintaining the workplace.

- **Sustain**
Sustaining is about maintaining the improvements made through the first four principles.

3.2 Standard procedures for organization and cleanliness.

Standard procedures for organization and cleanliness are essential for maintaining an efficient, safe, and productive workplace.

Workstation Organization

- **Procedure:** Ensure all tools, materials, and equipment are neatly organized and easily accessible. Use labels and storage solutions to designate spaces for each item.
- **Benefit:** Reduces time spent searching for tools and materials, improves efficiency, and minimizes errors.

Cleaning Schedule

- **Procedure:** Establish a regular cleaning schedule for all work areas, including floors, machines, and storage areas. Assign specific tasks to workers, such as wiping down machines at the end of each shift.
- **Benefit:** A clean workplace reduces the risk of accidents, keeps equipment in good condition, and improves the work environment.

Tool and Equipment Maintenance

- **Procedure:** Set guidelines for checking, cleaning, and maintaining tools and machines. Implement preventive maintenance to ensure equipment operates efficiently and reduces downtime.
- **Benefit:** Properly maintained tools and equipment lead to smoother operations and fewer defects in products.

Waste Management

- **Procedure:** Designate bins for waste disposal and recycling. Ensure that excess materials and waste are removed regularly to prevent clutter and keep the workspace clear.
- **Benefit:** Reduces environmental impact and maintains a tidy and safe work environment.

Standard Operating Procedures (SOPs)

- **Procedure:** Develop and implement clear SOPs for cleaning, organizing, and maintaining workstations. Ensure all employees are trained to follow these procedures consistently.
- **Benefit:** Ensures consistency, maintains high standards of cleanliness, and streamlines workflow.

Self-Check 3.3

Short Questions:

1. **Question:** What are the 5S principles?
 Answer:

2. **Question:** What does "Sort" mean in the 5S principles?
 Answer:

3. **Question:** What is the goal of "Set in Order"?
 Answer:

4. **Question:** What does "Shine" refer to in the 5S principles?
 Answer:

5. **Question:** What is involved in "Standardize"?
 Answer:

6. **Question:** Why is "Sustain" important in the 5S principles?
 Answer:

7. **Question:** What is the procedure for workstation organization?
 Answer:

Answer Key- 3.3

Short Questions with Answers:

1. **Question:** What are the 5S principles?
Answer: The 5S principles are practices aimed at improving workplace organization, safety, and efficiency: Sort, Set in Order, Shine, Standardize, and Sustain.
2. **Question:** What does "Sort" mean in the 5S principles?
Answer: "Sort" involves removing unnecessary items from the workspace to declutter the area and improve organization.
3. **Question:** What is the goal of "Set in Order"?
Answer: "Set in Order" means organizing materials and tools so that they are easy to find and access, improving workflow.
4. **Question:** What does "Shine" refer to in the 5S principles?
Answer: "Shine" refers to maintaining cleanliness in the workplace, including cleaning workstations, equipment, and tools regularly.
5. **Question:** What is involved in "Standardize"?
Answer: "Standardize" involves establishing consistent practices for organizing, cleaning, and maintaining the workplace.
6. **Question:** Why is "Sustain" important in the 5S principles?
Answer: "Sustain" is about maintaining the improvements made by continuing the practices from the first four principles to ensure long-term efficiency.
7. **Question:** What is the procedure for workstation organization?
Answer: The procedure involves ensuring tools, materials, and equipment are neatly organized and easily accessible, using labels and storage solutions.

Task Sheet -3.3

Task Name: Systematically identify, red-tag, and document all unused or unnecessary tools, materials, and items within the selected work area.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have two (2) hours to complete this demonstration.	
Working Procedure: ▪ Select and mark the observation area. ▪ Inspect all tools, materials, and storage points. ▪ Attach red tags to unused or unnecessary items. ▪ Record item name, location, and reason for tagging. ▪ Place tagged items in the designated holding area. ▪ Review findings with the supervisor and submit the list.	
Specific Information: ▪ Follow all safety and PPE guidelines. ▪ Use standard red tags provided by the trainer. ▪ Do not remove or dispose of any item without approval. ▪ Record clear item descriptions and exact locations. ▪ Maintain confidentiality of production materials. ▪ Submit the completed red-tag list on time.	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note (Red color) ● Flip chart ● Masking Tape

Information Sheet - 3.4

Learning Outcome - 4: Implement lean tools.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 4.1 Lean tools in the production process.
- 4.2 Just-in-Time techniques.
- 4.3 Jidoka principles.
- 4.4 Deviations from lean practices.

4.1 Lean tools in the production process.

Lean tools are designed to streamline production, eliminate waste, and improve efficiency.

Just-in-Time (JIT)

JIT focuses on producing only what is needed, when it is needed, and in the amount required. It minimizes excess inventory and waste.

Key Tools in Just-in-Time:

- **Takt Time:** The rate at which products must be produced to meet customer demand. It helps balance production speed and capacity.
- **One-Piece Flow:** Moving one unit at a time through the production process, reducing waiting time and minimizing inventory.
- **Line Balancing:** Allocating work evenly across workstations to avoid delays and overburdening certain workers or machines.
- **Single Minute Exchange of Dies (SMED):** Reducing setup times to enable quick changeovers between different products, maximizing machine use.
- **KANBAN:** A pull system that signals when to produce more items, helping to maintain optimal inventory levels and prevent overproduction.

Jidoka (Automation with a Human Touch)

Jidoka focuses on building quality into the process and enabling machines to detect problems automatically. It ensures that defects are detected early and addressed quickly.

Key Tools in Jidoka:

- **ANDON System:** A visual signal system that alerts workers and supervisors to any problems on the production line, enabling quick corrective action.
- **POKA YOKE:** Error-proofing tools or techniques designed to prevent defects from occurring by making mistakes impossible or easily detectable.
- **Skills Matrix:** A tool used to map the skills of workers, ensuring they are assigned to tasks where they are most competent, improving productivity and reducing mistakes.

- **Autonomation:** Automating processes while allowing workers to stop production if a defect is detected, ensuring quality is maintained.
- **Total Productivity Maintenance (TPM):** A proactive approach to maintaining and improving the effectiveness of equipment, reducing downtime and breakdowns.
- **Visual Management:** Using visual cues, such as charts, labels, and signs, to improve communication, ensure standard procedures, and track performance in real-time.

4.2 Just-in-Time techniques.

Just-in-Time (JIT) is a lean manufacturing technique aimed at reducing inventory costs and improving production efficiency.

Takt Time

Takt time is the maximum allowable time to produce a product in order to meet customer demand.

Benefit: Ensures production is aligned with demand, avoiding overproduction or underproduction.

One-Piece Flow

One-piece flow involves moving one unit of product through each production step at a time, rather than batching multiple units.

Benefit: Reduces work-in-progress inventory and speeds up production by eliminating bottlenecks.

Line Balancing

Line balancing ensures that each workstation in the production line is assigned a task that matches its capacity, preventing overburdening or underutilization. This creates a smooth and balanced production flow.

Benefit: Optimizes production time and resources, reducing delays and downtime.

Single Minute Exchange of Dies (SMED)

SMED is a technique that reduces the time required for machine setup or changeover. By simplifying and speeding up changeovers, production can switch between different products quickly and efficiently.

Benefit: Reduces downtime during setup, enabling more flexible production schedules and quicker response to demand changes.

KANBAN

KANBAN is a visual signaling system used to control inventory and production. It uses cards or electronic signals to indicate when materials need to be produced or replenished, helping to maintain optimal inventory levels without overstocking.

Benefit: Reduces inventory costs by producing only what is needed, when it is needed.

4.3 Jidoka principles.

Jidoka, also known as "automation with a human touch," is a key principle of lean manufacturing that focuses on building quality into the production process and empowering workers to stop the process when a problem is detected.

- **Detecting Abnormalities**

The first principle of Jidoka is the ability to detect problems or abnormalities in the production process immediately.

- **Benefit:** Prevents defects from continuing down the production line and improves overall quality control.

Stopping the Process

When a problem is detected, the process is stopped to avoid further defects. This empowers workers to take immediate corrective action or alert the supervisor to resolve the issue.

- **Benefit:** Ensures that defects are addressed as soon as they occur, preventing larger-scale issues and reducing waste.

Andon System

The Andon system is a visual management tool used to signal problems in the production process. When an issue arises, a light or sign is triggered, alerting workers and supervisors to the problem.

- **Benefit:** Provides real-time feedback and allows for quick resolution of production issues, reducing downtime.

Error-Proofing (Poka Yoke)

Poka Yoke devices are mechanisms designed to prevent mistakes from occurring.

- **Benefit:** Prevents defects from being produced in the first place, improving quality and reducing rework.

Empowering Workers

Jidoka empowers workers to make decisions and take action when they notice problems. This creates a more proactive and responsible workforce that contributes to maintaining quality throughout production.

- **Benefit:** Enhances worker involvement and accountability, leading to higher-quality output and a more engaged workforce.

Continuous Improvement (Kaizen)

Jidoka encourages continuous improvement (Kaizen) by analyzing the root causes of problems and making necessary adjustments to processes.

- **Benefit:** Drives ongoing improvements in production processes and quality, ensuring long-term success.

4.4 Deviations from lean practices.

Deviations from lean practices occur when production processes do not follow lean principles, leading to inefficiencies, waste, and reduced productivity.

- **Overproduction**
- **Excessive Inventory**
- **Unnecessary Motion**
- **Waiting**
- **Defects**
- **Overprocessing**
- **Underutilized Workers**

Self-Check 3.4

Short Questions:

1. **Question:** What are lean tools in the production process?
 Answer:

2. **Question:** What is Just-in-Time (JIT)?
 Answer:

3. **Question:** What is Takt Time in JIT?
 Answer:

4. **Question:** What is One-Piece Flow in JIT?
 Answer:

5. **Question:** How does Line Balancing work in JIT?
 Answer:

6. **Question:** What is the benefit of Single Minute Exchange of Dies (SMED)?
 Answer:

7. **Question:** What is KANBAN?
 Answer:

8. **Question:** What is Jidoka?
 Answer:

Answer Key- 3.4

Short Questions with Answers:

1. **Question:** What are lean tools in the production process?
 Answer: Lean tools aim to streamline production, eliminate waste, and improve efficiency, including techniques like Just-in-Time (JIT) and Jidoka.
2. **Question:** What is Just-in-Time (JIT)?
 Answer: JIT is a lean manufacturing technique that focuses on producing only what is needed, when it is needed, and in the amount required, minimizing excess inventory and waste.
3. **Question:** What is Takt Time in JIT?
 Answer: Takt Time is the rate at which products must be produced to meet customer demand, ensuring production aligns with demand without overproduction.
4. **Question:** What is One-Piece Flow in JIT?
 Answer: One-Piece Flow involves moving one unit of product through each production step at a time, reducing work-in-progress inventory and speeding up production.
5. **Question:** How does Line Balancing work in JIT?
 Answer: Line Balancing assigns tasks evenly across workstations to optimize production time, preventing overburdening or underutilization of resources.
6. **Question:** What is the benefit of Single Minute Exchange of Dies (SMED)?
 Answer: SMED reduces machine setup times, allowing quick changeovers between different products and improving production flexibility.
7. **Question:** What is KANBAN?
 Answer: KANBAN is a visual signaling system that helps control inventory and production, indicating when materials need to be produced or replenished to maintain optimal levels.
8. **Question:** What is Jidoka?
 Answer: Jidoka, or "automation with a human touch," focuses on building quality into production and empowering workers to stop the process when a problem is detected.

Task Sheet -3.4

Task Name: Identify one simple and suitable lean tool for shop-floor implementation and, as a group, develop clear guidelines and improvement suggestions for its practical application.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have two (2) hours to complete this demonstration.	
Working Procedure: ▪ Form groups and assign one lean tool to each group. ▪ Observe the selected production area. ▪ Identify a problem the tool can solve. ▪ Define how the tool will be applied on the floor. ▪ Create simple implementation steps. ▪ Record results and observations expected after implementation ▪ Prepare a short summary and present findings.	
Specific Information: ▪ One group must select only one lean tool. ▪ The tool must be simple and low-cost to implement. ▪ Observations must be based on actual shop-floor conditions. ▪ Provide clear step-by-step implementation guidelines. ▪ Include one expected benefit (safety, quality, delivery, or productivity). ▪ Follow all safety and supervisor approval rules. ▪ Keep the report brief, clear, and practical.	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note (Red color) ● Flip chart ● Masking Tape

Information Sheet - 3.5

Learning Outcome -5: Implement continuous improvement (Kaizen) activities.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 5.1 Kaizen activities to improve processes.
- 5.2 Improvement opportunities.
- 5.3 Results of improvement actions.
- 5.4 Outcomes of Kaizen activities.

5.1 Kaizen activities to improve processes.

- **Process simplification:** This focuses on analyzing each step of the work process and removing unnecessary or repetitive activities. The goal is to make the workflow more direct and efficient, and to reduce time, effort and error while improving overall productivity.
- **Workstation reorganization:** This involves arranging tools, materials, and equipment in a logical and ergonomic layout. Proper organization reduces unnecessary movement, improves operator comfort, and ensures a smoother flow of work in different operations.
- **Standardization of tasks:** This means defining and documenting the best and safest method for performing each task. By following the same standard process, operators can maintain consistent quality, reduce variation, and make training of new workers easier.
- **Minor equipment adjustments:** This includes small, low-cost changes to machines or tools, such as adjusting settings, replacing worn parts, or improving fixtures. These adjustments help improve performance, safety, and reliability without the need for major investment.
- **Problem identification and solution:** This involves spotting issues through observation and data, finding the root cause, and applying simple, practical fixes to prevent the problem from happening again.

5.2 Improvement opportunities.

Improvement opportunities are identified by regularly reviewing process performance, observing daily work, and analyzing data to find gaps, inefficiencies, or quality issues that can be improved through simple and practical actions.

5.3 Results of improved actions.

Results of improved actions are measured and documented by tracking key performance indicators, comparing before-and-after data, and recording outcomes to verify effectiveness and support future continuous improvement. The following steps will improve the work process:

- Observe the current process.
- Collect basic performance data.

- Identify problems and inefficiencies.
- Find the root cause of each issue.
- Identify improvement opportunities.
- Plan small, practical changes.
- Implement the changes.
- Monitor the process after changes.
- Measure results and compare with previous performance.
- Document outcomes and standardize successful improvements.

5.4 Outcomes of Kaizen activities.

- Improved productivity and faster work processes.
- Reduced waste and unnecessary movements.
- Better and more consistent product quality.
- Improved workplace organization and safety.
- Higher employee involvement and teamwork.
- Lower operating and production costs.
- Faster problem identification and faster solution.
- Standardized work methods and procedures.

Self-Check 3.5

Short Questions:

1. **Question:** What is Kaizen?
Answer:

2. **Question:** Why is Kaizen important in the workplace?
Answer:

3. **Question:** What is process simplification?
Answer:

4. **Question:** What is workstation reorganization?
Answer:

5. **Question:** What are minor equipment adjustments?
Answer:

6. **Question:** How are problems identified in Kaizen?
Answer:

7. **Question:** Why are small changes preferred in Kaizen?
Answer:

8. **Question:** How are employees involved in Kaizen?
Answer:

9. **Question:** What is the outcome of successful Kaizen?
Answer:

Answer Key- 3.5

Short Questions with Answers:

1. **Question:** What is Kaizen?
Answer: Kaizen is a continuous improvement approach that focuses on making small, regular improvements in work processes.
2. **Question:** Why is Kaizen important in the workplace?
Answer: It helps improve efficiency, quality, and employee involvement while reducing waste and costs.
3. **Question:** What is process simplification?
Answer: It means removing unnecessary steps to make work faster and easier.
4. **Question:** What is workstation reorganization?
Answer: It is arranging tools and materials to reduce movement and improve workflow.
5. **Question:** What are minor equipment adjustments?
Answer: Small, low-cost changes to machines or tools to improve performance and safety.
6. **Question:** How are problems identified in Kaizen?
Answer: Through observation, data review, and employee feedback.
7. **Question:** Why are small changes preferred in Kaizen?
Answer: They are easier to implement and cause less disruption to work.
8. **Question:** How are employees involved in Kaizen?
Answer: By sharing ideas, joining problem-solving, and participating in improvement activities.
9. **Question:** What is the outcome of successful Kaizen?
Answer: Better productivity, quality, and teamwork.

Task Sheet - 3.5

Task Name: Implement three simple, low-cost Kaizen ideas to reduce waste on the production floor.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have two (2) hours to complete this demonstration.	
Working Procedure: ▪ Select one production area for observation. ▪ Observe the production floor areas and process of work and note any form of waste or any deviations. ▪ List three areas of improvement. ▪ Match each improvement area with a Kaizen idea. ▪ Discuss with supervisor and check the feasibility of implementation. ▪ Define work implementation processes. ▪ Estimate the expected benefit of work process. ▪ Prepare a short summary and submit.	
Specific Information: ▪ Provide three Kaizen ideas. ▪ Ideas must be simple, low-cost, and practical. ▪ Focus on waste reduction (time, motion, material, defects, waiting, or inventory). ▪ Provide suggestions based on observations. ▪ Include one expected benefit for each of the ideas. ▪ Follow safety rules and instructions. ▪ Keep the report clear, brief, and actionable.	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note ● Flip chart ● Masking Tape

Module-4

Module: Optimizing Machine and Equipment Utilization

Unit Code: SICIP-LET-IPI-04-O

**Skills for Industry Competitiveness and Innovation Program (SICIP)
Finance Division, Ministry of Finance**

Module–4

Module Title: Optimizing Machine and Equipment Utilization.

Unit Code: SICIP-LET-IPI-4-O

Nominal Hours: 40 Hrs.

Module Description: This module covers the skills, knowledge and attitudes required to optimize machine and equipment utilization. It specifically includes the task of identifying machines in the production line, recording machine downtime and its causes, scheduling regular inspection and implementing quick changeover (SMED) techniques.

Learning Outcomes: After completing of this module, the trainee will be able to;

1. Identify machines in the production line.
2. Record machine downtime and its causes.
3. Schedule regular inspection.
4. Implement quick changeover (SMED) techniques.

Assessment Criteria:

1. Machines used in the leather goods production line are identified and listed.
2. Machines used in footwear production line are identified and listed.
3. Each machine is observed for its function and operation.
4. Machine types and Specifics are recorded accurately.
5. Location of machines within the production line is documented.
6. Safety features and operating procedures of machines are noted.
7. Machine downtime is recorded systematically during production.
8. Start and end times of each downtime event are documented.
9. Causes of downtime are identified.
10. Frequency and duration of machine stoppages are analyzed.
11. Observations are compared with maintenance schedules and standards.
12. Downtime data are documented using approved formats or tools.
13. Reports are prepared to support corrective and preventive actions.
14. Regular inspection schedules for machines are prepared and documented.
15. Inspection intervals are determined based on manufacturer guidelines and production needs.
16. Inspection activities (CLITA) are planned and communicated to relevant personnel.
17. Machines are checked according to the scheduled plan.
18. Inspection results, including any defects or issues, are recorded.
19. Deviations from normal operation are reported for corrective action.
20. Inspection schedules are reviewed and updated as needed to ensure reliability.
21. SMED (Single Minute Exchange of Die) techniques are implemented on relevant machines.
22. Current changeover processes are observed and recorded.
23. Internal and external setup activities are identified and separated.
24. Time required for each changeover step is measured and documented.
25. SMED steps are reorganized to minimize downtime and improve efficiency.
26. Quick changeover methods are applied and monitored for effectiveness.

Information Sheet – 4.1

Learning Outcome -1: Identify machines in the production line.

Learning Objectives: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 1.1 Machines used in the leather goods production line.
- 1.2 Machines used in footwear production line.
- 1.3 Machine types and Specifics
- 1.4 Safety features and operating procedures of machines.

1.1 Machines used in the leather goods production line.

Machines play a crucial role in the leather goods production line, increasing efficiency, ensuring precision, and improving product quality. Below are the key machines commonly used in leather goods manufacturing:

Cutting Machine

A cutting machine is used to cut leather into the required shapes and sizes for different products.

Skiving Machine

The skiving machine is used to thin the edges of leather pieces to ensure smooth seams and prevent bulkiness during stitching.

Stitching/Sewing Machine

A stitching or sewing machine is used to join leather pieces together. It's essential for creating the structure of leather goods such as bags, wallets, and shoes.

Edge Creasing Machine

This machine is used to create sharp, clean creases along the edges of leather goods.

Edge Coloring Machine

Edge coloring machines apply color to the edges of leather products, enhancing their aesthetics and providing a neat, finished look.

Embossing Machine

An embossing machine is used to imprint designs or logos on leather. This process adds texture and branding to leather goods, improving their visual appeal.

Riveting/Press Machine

Riveting and press machines are used to attach hardware, such as rivets, buttons, and studs, to leather products. These machines ensure strong and durable attachments for accessories.

Gluing/Adhesive Application Machine

Gluing machines are used to apply adhesives to leather or other materials for bonding.

Polishing/Buffering Machine

Polishing and buffering machines are used to give leather products a smooth, shiny finish.

Packaging Machine

Packaging machines are used to package finished leather goods for shipment.

1.2 **Machines used in footwear production line.**

Machines are essential in the footwear production process, as they increase efficiency, ensure precision, and help create high-quality products. Below are the key machines used in the footwear production line:

Cutting Machine

Cutting machines are used to precisely cut leather, rubber, and other materials into the required shapes and sizes for footwear components.

Skiving Machine

Skiving machines are used to thin the edges of leather or other materials, making them easier to stitch and reducing bulk at seams, ensuring a smooth, professional finish.

Stitching/Sewing Machine

Stitching machines are used to sew together various parts of the shoe, including the upper, lining, and other components.

Lasting Machine

Lasting machines are used to shape the upper part of the footwear to fit the mold (last), giving the shoe its final form and ensuring a proper fit for the wearer.

Sole Pressing/Attaching Machine

These machines are used to attach the sole to the upper part of the footwear.

Edge Trimming Machine

Edge trimming machines are used to trim the edges of the footwear components.

Finishing/Polishing Machine

Finishing and polishing machines are used to give footwear a smooth, shiny finish, removing imperfections and enhancing the product's overall appearance.

Embossing or Branding Machine

Embossing machines are used to imprint logos, designs, or other branding elements onto the surface of the footwear.

Riveting/Press Machine

Riveting and press machines are used to attach hardware such as rivets, eyelets, and studs to the footwear.

Packaging Machine

Packaging machines are used to pack the finished footwear products for shipment. They help ensure that products are securely and efficiently packed, ready for delivery.

1.3 Machine types and Specifics

Cutting Machine

Type: Hydraulic, Pneumatic, or Electric-powered

Specific:

- **Cutting Area:** Adjustable cutting sizes for different footwear or leather goods.
- **Precision:** High accuracy to minimize material wastage.
- **Blade Type:** Rotary or straight blades depending on material thickness.

Skiving Machine

Type: Manual or Automatic

Specific:

- **Cutting Depth:** Adjustable to control the thickness of the material at the edges.
- **Speed:** Variable speeds for different material types (leather, fabric, etc.).
- **Blade:** Sharp, durable blades for smooth edge skiving.

Stitching/Sewing Machine

Type: Lockstitch, Overlock, or Zigzag

Specific:

- **Needle Type:** Size and type adjustable based on material thickness.
- **Stitch Speed:** Adjustable stitching speed for accuracy and consistency.
- **Thread Tension:** Adjustable tension to suit various material types.

Lasting Machine

Type: Hydraulic or Pneumatic-powered

Specific:

- **Pressure Control:** Adjustable pressure settings for different shoe materials.
- **Heat Settings:** Some models include heating elements to assist with the molding process.
- **Last Sizes:** Adjustable lasts for various shoe sizes and designs.

Sole Pressing/Attaching Machine

Type: Pneumatic or Hydraulic Press

Specific:

- **Pressure Control:** Adjustable pressure to ensure proper sole attachment.
- **Temperature Control:** Some models include heat settings for better bonding of soles.
- **Machine Size:** Designed to accommodate various shoe sizes and sole thicknesses.

Edge Trimming Machine

Type: Electric or Pneumatic

Specific:

- **Trimming Capacity:** Adjustable settings for different leather thicknesses and edge types.
- **Blade Type:** Rotary or straight blades for smooth trimming.
- **Speed:** Variable speed for precision trimming.

Finishing/Polishing Machine

Type: Rotary or Belt-driven Polisher

Specific:

- **Speed Control:** Adjustable speed for various leather finishes.
- **Brush Type:** Soft brushes or felt pads for polishing surfaces without damage.
- **Heat Settings:** Some models have heating functions for glossing or smoothing.

Embossing or Branding Machine

Type: Heat Press or Roller Press

Specific:

- **Pressure:** Adjustable pressure for different embossing effects.
- **Temperature:** Controlled heating to ensure perfect impressions without damaging the material.
- **Design Options:** Customizable plates or rollers for logos and designs.

Riveting/Press Machine

Type: Pneumatic or Hydraulic Press

Specific:

- **Pressure Settings:** Adjustable pressure for attaching rivets, studs, or eyelets securely.
- **Tool Compatibility:** Various dies for different types of rivets and fasteners.
- **Cycle Time:** Quick cycle time for high-speed attachment.

Packaging Machine

Type: Automatic or Semi-Automatic

Specific:

- **Packaging Speed:** Adjustable speed to match production output.
- **Material Compatibility:** Supports different packaging materials (boxes, plastic wraps, etc.).
- **Size Adjustability:** Suitable for various sizes and shapes of products.

1.4 Safety features and operating procedures of machines.

Cutting Machine

Safety Features:

- Safety guards to protect hands from blades.
- Emergency stop button.
- Anti-slip mats to ensure stable operation.

Operating Procedures:

- Always keep hands clear of the cutting area.
- Ensure the blade is properly aligned and secure before starting.
- Shut down the machine when not in use.

Skiving Machine

Safety Features:

- Protective covers around the blade area.
- Automatic shut-off in case of malfunction.

Operating Procedures:

- Use gloves and protective gear when handling materials.
- Ensure the machine is properly maintained to avoid blade accidents.
- Keep the machine clean to prevent jams.

Stitching/Sewing Machine

Safety Features:

- Needle guard to prevent accidental contact.
- Automatic needle stops in case of malfunction.

Operating Procedures:

- Always ensure the needle is secure before operating.
- Keep fingers away from the stitching area while the machine is running.
- Turn off machine power when making adjustments.

Lasting Machine

Safety Features:

- Foot pedal control to prevent accidental engagement.
- Pressure release valve to avoid overpressure.

Operating Procedures:

- Ensure the last is securely placed before starting the machine.
- Check for any obstructions in the machine before operation.
- Never attempt to fix jams while the machine is running.

Sole Pressing/Attaching Machine

Safety Features:

- Safety barriers to protect workers from moving parts.
- Pressure sensors to ensure safe operation.

Operating Procedures:

- Confirm the sole is aligned properly before starting.
- Always check pressure settings before each use.
- Use gloves and safety gear when handling heavy materials.

Edge Trimming Machine

Safety Features:

- Blade covers to prevent accidental cuts.
- Emergency stop button within easy reach.

Operating Procedures:

- Ensure all parts are correctly positioned before starting.
- Keep hands and loose clothing away from cutting areas.
- Clean regularly to prevent blockages.

Finishing/Polishing Machine

Safety Features:

- Protective shields to prevent debris from flying out.
- Automatic shut-off if the machine overheats.

Operating Procedures:

- Check the polishing wheel for cracks before use.
- Wear goggles and protective clothing.
- Turn off machine power before cleaning.

Embossing or Branding Machine

Safety Features:

- Heat-resistant shields to protect from hot surfaces.
- Emergency stop function in case of malfunction.

Operating Procedures:

- Always wear heat-resistant gloves when handling hot parts.
- Ensure the branding plates are securely fixed before operating.
- Keep the area around the machine clean and free of flammable materials.

Riveting/Press Machine

Safety Features:

- Safety shields around the press area.
- Pressure relief valves to prevent over-pressurization.

Operating Procedures:

- Ensure the rivet is properly positioned before pressing.
- Never override safety features.

- Check machine alignment before each use.

Packaging Machine

Safety Features:

- Light curtains or sensors to detect objects and prevent injuries.
- Lock-out/tag-out systems for maintenance.

Operating Procedures:

- Keep hands and tools away from moving parts.
- Ensure the packaging material is properly loaded.
- Turn off the machine when performing maintenance or adjustments.

Self-Check - 4.1

Short Questions:

1. **Question:** What role do machines play in the leather goods production line?
Answer: Machines improve efficiency, precision, and product quality in the leather goods production line, helping to streamline processes like cutting, stitching, and polishing.
2. **Question:** What is the function of a cutting machine in leather goods production?
Answer: A cutting machine is used to cut leather into the required shapes and sizes for various products.
3. **Question:** How does a skiving machine improve leather production?
Answer: The skiving machine thins the edges of leather pieces to ensure smooth seams and prevent bulkiness during stitching.
4. **Question:** What is the purpose of a stitching machine in leather goods manufacturing?
Answer: A stitching machine is used to join leather pieces together, essential for creating leather goods such as bags, wallets, and shoes.
5. **Question:** How does an embossing machine enhance leather goods?
Answer: An embossing machine imprints designs or logos on leather, adding texture and branding, and enhancing the product's visual appeal.
6. **Question:** What is the role of a riveting/press machine in footwear production?
Answer: The riveting/press machine is used to attach hardware like rivets, eyelets, and studs to footwear, ensuring secure and durable attachments.
7. **Question:** What are the Specifics of a cutting machine?
Answer: A cutting machine may be hydraulic, pneumatic, or electric-powered with adjustable cutting areas, high precision, and specific blade types like rotary or straight.
8. **Question:** What is the safety feature of a stitching machine?
Answer: A stitching machine has a needle guard to prevent accidental contact and automatic needle stops in case of malfunction.

Answer Key - 4.1

Short Questions Answers:

1. **Question:** What role do machines play in the leather goods production line?
Answer: Machines improve efficiency, precision, and product quality in the leather goods production line, helping to streamline processes like cutting, stitching, and polishing.
2. **Question:** What is the function of a cutting machine in leather goods production?
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Answer: A cutting machine may be hydraulic, pneumatic, or electric-powered with adjustable cutting areas, high precision, and specific blade types like rotary or straight.
8. **Question:** What is the safety feature of a stitching machine?
Answer: A stitching machine has a needle guard to prevent accidental contact and automatic needle stops in case of malfunction.

Task Sheet – 4.1

Task Name: Document and list the types of machines used on the production floor and their key activities.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have two (2) hours to complete this demonstration.	
Working Procedure: ▪ Obtain permission from the section supervisor. ▪ Observe all machines in the assigned area. ▪ Record machine name, model/type, and location. ▪ List the main activity or operation performed by each machine. ▪ Note any safety features or operating precautions. ▪ Verify details with the operator or supervisor. ▪ Compile findings into a clean summary and submit.	
Specific Information: ▪ Each group must cover one assigned section only. ▪ Record all major machines in that section. ▪ Use actual machine nameplates or SOPs for identification. ▪ Do not interfere with machine operation. ▪ Follow all PPE and safety guidelines. ▪ Ensure clear and accurate activity descriptions. ▪ Submit the report neatly and on time.	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note ● Flip chart ● Masking Tape

Information Sheet - 4.2

Learning Outcome-2: Record machine downtime and its causes.

Learning Objectives: After completing this information sheet, learners will be able to explain, define and interpret the following contents:

Contents:

- 2.1 Machine downtime.
- 2.2 Causes of downtime.
- 2.3 Frequency and duration of machine stoppages.
- 2.4 Reports to support corrective and preventive actions.

2.1 Machine downtime.

Machine downtime is the period of time when a machine is not operating or producing output during planned production hours. It occurs due to reasons such as machine breakdowns, material shortages, setup or changeovers, power failures, maintenance, or quality issues.

What is recorded?

- Total time the machine is not running during planned production time
- Start time and end time of each downtime event
- Reason/category of downtime
- Machine/line ID and operator name
- Impact on production (lost output or delayed orders)

2.2 Causes of downtime.

Mechanical faults cause machine downtime when parts such as bearings, belts, gears, or motors become worn, misaligned, or broken, preventing the machine from operating smoothly and requiring repair or replacement before production can continue.

Electrical failures lead to downtime due to problems like power interruptions, faulty wiring, damaged control panels, or sensor errors, which stop the machine from receiving or processing the signals needed to run safely and correctly.

Operator errors result in downtime when machines are set up incorrectly, safety procedures are not followed, or controls are used improperly, causing the machine to stop or produce defects that require correction before restarting.

Tool wear causes stoppages when cutting, stitching, or forming tools become dull, damaged, or misaligned, reducing product quality or machine performance and making it necessary to change or adjust the tools.

Lack of materials creates downtime when raw materials, components, or accessories are not available at the workstation, forcing the machine to remain idle until the required items are supplied.

2.3 **Frequency and duration of machine stoppages.**

- To identify the most frequent causes of stoppages and focus improvement efforts on the biggest problems.
- To reduce total downtime by targeting long-duration and repeated stoppages.
- To improve machine efficiency and OEE/OWE performance.
- To support preventive maintenance planning and avoid unexpected breakdowns.
- To improve production planning and delivery reliability.
- To optimize operator training and standard operating procedures (SOPs).

2.4 **Reports to support corrective and preventive actions.**

Reports are prepared to document machine issues, downtime causes, and performance gaps in a clear and structured way. This helps maintenance and production teams understand what went wrong and where immediate corrective actions are needed.

These reports also support preventive actions by identifying recurring problems and trends over time, allowing teams to improve maintenance plans, update SOPs, and reduce the chances of future breakdowns and production losses.

Self-Check – 4.2

Short Questions:

1. **Question:** What is a machine breakdown?
Answer:
2. **Question:** What is the most common cause of machine breakdown?
Answer:
3. **Question:** Can operator error cause machine breakdown?
Answer:
4. **Question:** How does poor lubrication affect machines?
Answer:
5. **Question:** Why is tool wearing a breakdown reason?
Answer:
6. **Question:** How does material quality affect machine breakdown?
Answer:
7. **Question:** What is preventive maintenance?
Answer:
8. **Question:** How can lack of training lead to breakdowns?
Answer:

Answer Key- 4.2

Short Questions with Answers:

1. **Question:** What is a machine breakdown?
Answer: A machine breakdown is when a machine stops working and cannot continue production without repair.
2. **Question:** What is the most common cause of machine breakdown?
Answer: Lack of preventive maintenance and worn-out parts.
3. **Question:** Can operator error cause machine breakdown?
Answer: Yes, incorrect setup or improper use can damage machine components.
4. **Question:** How does poor lubrication affect machines?
Answer: It increases friction, leading to overheating and part failure.
5. **Question:** Why is tool wearing a breakdown reason?
Answer: Worn tools reduce performance and can damage the machine or product.
6. **Question:** How does material quality affect machine breakdown?
Answer: Poor or inconsistent materials can jam or overload the machine.
7. **Question:** What is preventive maintenance?
Answer: Regular planned servicing to prevent machine failure.
8. **Question:** How can lack of training lead to breakdowns?
Answer: Untrained operators may misuse machines or ignore warning signs.

Job Sheet – 4.2

Task Name: Observe and record machine breakdown details—including the reason, start time, duration

Instructions:	
Read and understand the directions carefully: 1. This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. 2. This assessment activity will be used to measure your underpinning knowledge and skills 3. You will have fifteen (15) minutes to familiarize yourself with the resources to be used 4. You have two (1) hours to complete this demonstration.	
Working Procedure: 1. Obtain permission from the line supervisor. 2. Locate the breakdown record sheet on the machine. 3. Record the start time and end time. 4. Note the reason and type of breakdown. 5. Verify the entry with the operator or supervisor. 6. Compile the data into a summary and submit.	
Specific Information: 1. One trainee must cover one production line only. 2. Record exact time and duration in minutes. 3. Clearly classify the type of breakdown (mechanical, electrical, operational, etc.). 4. Do not interfere with maintenance or machine operation. 5. Follow all PPE and safety rules. 6. Ensure accurate, neat, and complete entries.	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note (red color) ● Flip chart ● Masking Tape

Information Sheet – 4.3

Learning Outcome -3: Schedule regular inspection.

Learning Objectives: After completing this information sheet, learners will be able to explain, define and interpret the following contents

Contents:

- 3.1 Regular inspection schedules for machines.
- 3.2 Inspection intervals based on manufacturer guidelines and production needs.
- 3.3 Inspection activities (CLITA).
- 3.4 Deviations from normal operation.
- 3.5 Inspection schedules.

3.1 Regular inspection schedules for machines.

Machine inspection is the systematic process of checking a machine's condition, performance, and safety to ensure it is working properly, producing quality output, and not posing any risk to operators or products.

Typical points in a schedule:

- Daily: Clean machine, check oil/air supply, inspect visible parts, test safety guards and switches
- Weekly: Check bolts, belts, sensors, calibration, and abnormal noise or vibration
- Monthly: Inspect electrical connections, lubrication system, alignment, and wear parts
- Quarterly/Yearly: Full machine audit, accuracy test, and preventive maintenance review

3.2 Inspection activities (CLITA).

CLITA is a structured method used in machine inspection and autonomous maintenance. It stands for:

C – Clean: Remove dust, lint, oil, and waste from machine surfaces and working areas. Helps reveal hidden defects like cracks, leaks, or loose parts

L – Lubricate: Apply oil or grease to moving and friction parts as per standard. Reduces wear, overheating, and unexpected breakdowns

I – Inspect: Check machine condition, alignment, bolts, belts, sensors, guards, and abnormal noise/vibration. Compare actual condition with standard checklist

T – Tighten: Tighten loose nuts, bolts, screws, and fittings. Prevents misalignment, vibration, and safety risks

A – Adjust: Set correct tension, pressure, speed, or alignment. Ensures machine runs within standard operating limits and maintains quality

Purpose of CLITA

- Prevent machine breakdowns
- Improve safety and product quality
- Extend machine life
- Support operator-led maintenance (Autonomous Maintenance)
- Improve Overall Equipment Effectiveness (OEE)

3.3 Deviations from normal operation.

Deviations from normal machine operation are promptly reported to the responsible supervisor or maintenance team. This ensures that issues such as unusual noise, vibration, temperature changes, or performance drops are addressed before they impact safety or production quality.

The reported deviations are logged with details of the machine, time, and observed condition, along with the corrective actions assigned. Follow-up checks are conducted to confirm that the problem has been resolved and the machine is restored to standard operating condition.

3.4 Inspection schedules.

Inspection schedules are reviewed and updated means the planned timing, frequency, and scope of machine inspections are regularly checked to ensure they still match the actual machine condition, production demands, and risk level.

- To prevent unexpected machine breakdowns and production stoppages.
- To focus inspections on critical and high-risk machine parts.
- To improve machine reliability and extend equipment life.
- To maintain consistent product quality and safety standards.
- To align inspection frequency with changes in production volume or machine condition.

Self-Check - 4.3

Short Questions:

1. **Question:** What is machine inspection?
Answer:
2. **Question:** Why is machine inspection important?
Answer:
3. **Question:** What does CLITA stand for?
Answer:
4. **Question:** What is preventive maintenance?
Answer:
5. **Question:** Why should inspection results be recorded?
Answer:
6. **Question:** What action is taken when a deviation is found?
Answer:
7. **Question:** What happens if inspections are not done regularly?
Answer:
8. **Question:** How does inspection improve product quality?
Answer:

Answer Key – 4.3

Short Questions with Answers:

1. **Question:** What is machine inspection?
Answer: Machine inspection is the systematic checking of a machine's condition, safety, and performance to ensure it operates correctly and produces quality output.
2. **Question:** Why is machine inspection important?
Answer: It helps prevent breakdowns, improves safety, maintains product quality, and extends machine life.
3. **Question:** What does CLITA stand for?
Answer: CLITA stands for Clean, Lubricate, Inspect, Tighten, and Adjust.
4. **Question:** What is preventive maintenance?
Answer: Preventive maintenance is planned maintenance done to prevent machine failure before it happens.
5. **Question:** Why should inspection results be recorded?
Answer: To track machine condition, identify recurring problems, and support maintenance planning.
6. **Question:** What action is taken when a deviation is found?
Answer: It is reported to maintenance and corrective action is assigned and followed up.
7. **Question:** What happens if inspections are not done regularly?
Answer: Machines may fail unexpectedly, causing downtime, quality issues, and safety risks.
8. **Question:** How does inspection improve product quality?
Answer: By ensuring machines operate accurately and consistently within standard settings.

Task Sheet – 4.3

Task Name: Assess and document the current machine inspection method, identify performance gaps, and propose actionable improvements.

Instructions:	
Read and understand the directions carefully: 1. This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. 2. This assessment activity will be used to measure your underpinning knowledge and skills 3. You will have fifteen (15) minutes to familiarize yourself with the resources to be used 4. You have two (2) hours to complete this demonstration.	
Working Procedure: 1. Observe the machine inspection process in real time. 2. Review the inspection checklist or record sheet used. 3. Note inspection frequency, responsible person, and method. 4. Identify any missing steps or unclear standards. 5. Develop simple improvement suggestions as a group. 6. Prepare a short summary and submit.	
Specific Information: 1. Each group must observe one assigned section only. 2. Use actual inspection records or checklists for reference. 3. Do not interfere with machine operation or maintenance. 4. Follow all PPE and safety guidelines. 5. Provide clear and practical improvement suggestions. 6. Base findings on real observations, not assumptions. 7. Keep the report neat, accurate, and on time.	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note (red color) ● Flip chart ● Masking Tape

Information Sheet- 4.4

Learning Outcome-4: Implement quick changeover (SMED) techniques.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 4.1 SMED (Single Minute Exchange of Die) techniques.
- 4.2 Current changeover processes.
- 4.3 Internal and external setup activities.
- 4.4 SMED steps to minimize downtime and improve efficiency.
- 4.5 Quick changeover methods.

4.1 SMED (Single Minute Exchange of Die) techniques.

SMED is a Lean manufacturing method used to reduce machine changeover or setup time to less than 10 minutes ("single-digit minutes").

- Separating Internal and External Setup: Identify which tasks must be done while the machine is stopped (internal) and which can be done while it is running (external). Move as many activities as possible to external setup to reduce downtime.
- Parallel Operations: Assign multiple workers to perform different setup tasks at the same time instead of one person doing everything sequentially. This significantly shortens total changeover time.
- Standardizing Tools: Use common tools, fixed locations, and uniform fasteners across machines. This reduces time wasted searching for tools and prevents errors during setup.
- Pre-Preparation of Materials: Prepare materials, accessories, programs, and settings in advance before the machine stops. This ensures a smooth and quick transition to the next product or style.

4.2 Current changeover processes.

- Observe the complete changeover process from the last good piece of the current style to the first good piece of the next style.
- Record each activity step-by-step, including machine stop time, adjustments, and material loading.
- Measure and note the time taken for every step using a stopwatch or standard timing sheet.
- Identify who performs each task and whether it requires the machine to be stopped or can be done while running.
- Document any delays, tool searching, rework, or communication gaps during the process.

4.3 Internal and external setup activities.

Internal: tasks done while the machine is stopped

- These are activities that require the machine to be powered off or idle to ensure safety and accuracy.
- Typically include changing tools, dies, needles, guides, or fixtures that directly affect machine operation.
- Involve machine adjustments and fine-tuning, such as setting stitch length, pressure, speed, or alignment.
- Require verification and trial runs to confirm the setup is correct before restarting production.

External Setup – Tasks Done While the Machine is Running

- These are activities that can be completed in advance without stopping the machine.
- Include preparing materials, threads, accessories, programs, and tools needed for the next job.
- Involve reviewing work instructions, checklists, and quality standards for the upcoming product.
- Allow operators and helpers to coordinate and stage items near the workstation for quick access.

4.4 SMED steps to minimize downtime and improve efficiency.

- Observe and record the current changeover process, including each step, time taken, and delays.
- Separate tasks into internal (machine stopped) and external (machine running) activities.
- Convert as many internal tasks as possible into external tasks.
- Simplify and standardize tools, methods, and setup steps.
- Implement parallel operations by assigning multiple workers to perform tasks simultaneously.
- Test the new process, measure changeover time, and continuously improve.

4.5 Quick changeover methods.

How to Implement Quick Changeover (SMED) Methods in a Manufacturing Organization

- Form a cross-functional team (production, maintenance, quality, and supervisors).
- Observe and record the current changeover process step-by-step with time measurements.
- Separate activities into internal (machine stopped) and external (machine running).
- Convert internal tasks to external by preparing tools, materials, and settings in advance.
- Standardize tools and methods using checklists, visual aids, and fixed storage locations.
- Introduce parallel operations so multiple workers perform tasks at the same time.
- Apply quick-release devices and simple fixtures to reduce adjustment time.
- Train operators and helpers on the new standardized changeover procedure.
- Pilot the improved process on one machine or line before full rollout.
- Measure results and continuously improve using setup time, downtime, and quality data. Standardized work methods and procedures.

Self-Check – 4.4

Short Questions:

1. **Question:** What is Quick Changeover?
Answer:
2. **Question:** What does SMED stand for?
Answer:
3. **Question:** Why is Quick Changeover important in manufacturing?
Answer:
4. **Question:** What is internal setup?
Answer:
5. **Question:** What is external setup?
Answer:
6. **Question:** How can internal tasks be reduced?
Answer:
7. **Question:** What is meant by parallel operations?
Answer:
8. **Question:** How does standardization help in SMED?
Answer:

Answer Key – 4.4

Short Questions Answers:

1. **Question:** What is Quick Changeover?
Answer: Quick Changeover is a method used to reduce the time needed to switch a machine from one product or style to another.
2. **Question:** What does SMED stand for?
Answer: SMED stands for Single-Minute Exchange of Dies.
3. **Question:** Why is Quick Changeover important in manufacturing?
Answer: It reduces downtime, increases production capacity, and improves delivery performance.
4. **Question:** What is internal setup?
Answer: Internal setup includes tasks that must be done while the machine is stopped.
5. **Question:** What is external setup?
Answer: External setup includes tasks that can be done while the machine is running.
6. **Question:** How can internal tasks be reduced?
Answer: By converting them into external tasks through pre-preparation of tools, materials, and settings.
7. **Question:** What is meant by parallel operations?
Answer: Parallel operations mean multiple workers perform setup tasks at the same time instead of one person doing them one by one.
8. **Question:** How does standardization help in SMED?
Answer: It reduces variation, prevents errors, and speeds up the setup process.

Task Sheet – 4.4

Task Name: Observe a production line changeover and document best practices and improvement points, then develop a simple SOP for changeover methodology.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hours to complete this demonstration.	
Working Procedure: ▪ Watch the complete changeover process from end to start of the next run. ▪ Record time, sequence of activities, and responsible persons. ▪ Note good practices and any delays, errors, or waiting. ▪ Identify improvement opportunities related to your assigned M. ▪ Draft a simple SOP for your M with clear steps and responsibilities. ▪ Prepare & review the SOP with the trainer and finalize.	
Specification Information: ▪ Form groups and assign one M (Man/Machine/Material/Method) to each group. ▪ Get approval from the line supervisor to observe the changeover. ▪ Each group must focus on only one M (Man, Machine, Material, or Method). ▪ Observe a full changeover cycle. ▪ Use actual shop-floor practices as the SOP base. ▪ Include clear steps, roles, and safety points in the SOP. ▪ Do not interrupt production or operators during observation. ▪ Follow all PPE and safety rules. ▪ Provide at least one improvement suggestion. ▪ Keep documentation clear, simple, and practical.	
Resources Required:	
Tools and materials:	● Computer or laptop ● Internet access ● Stop watch ● Video camera ● Paper ● Markers ● Sticky note (red color) ● Flip chart ● Masking Tape

Module-5

Module: Improving Workforce Efficiency

Unit Code: SICIP-LET-IPI-05-O

**Skills for Industry Competitiveness and Innovation Program (SICIP)
Finance Division, Ministry of Finance**

Module -5

Module Title: Improving Workforce Efficiency.

Unit code: SICIP-LET-IPI-05-0

Nominal hours: 30 Hrs.

Module Description: This module covers the skills, knowledge and attitudes required to improve workforce efficiency. It specifically includes the task of identifying skill levels of workers, setting realistic production targets, assigning tasks based on worker skills capacity and monitoring performance and provide feedback.

Learning Outcomes: After completing this module, the trainees will be able to:

1. Identify skill levels of workers.
2. Set realistic production targets.
3. Assign tasks based on worker skills capability.
4. Monitor performance and provide feedback.

Assessment Criteria:

1. Workers are categorized according to proficiency levels.
2. Workers' skill levels are identified using a skills matrix.
3. Competencies required for each role are documented and compared with worker abilities.
4. Observations and assessments are recorded systematically.
5. Gaps in skills and knowledge are detected and noted.
6. Skills matrix is updated regularly to reflect current capabilities.
7. Production targets are set based on analysis of current capacity and resources.
8. Historical production data and performance trends are reviewed.
9. Targets are aligned with quality and efficiency standards.
10. Realistic timelines for achieving production goals are established.
11. Workforce capabilities and machine availability are considered.
12. Targets are periodically reviewed and adjusted based on performance feedback.
13. Tasks are assigned according to workers' skill levels and competencies.
14. Worker capabilities are reviewed using the skills matrix.
15. Job responsibilities are matched with proficiency and experience.
16. Assignments are documented and communicated clearly.
17. Task allocation is monitored to ensure balanced workload.
18. Adjustments are made based on performance and observed efficiency.
19. Worker performance is monitored regularly against set targets.
20. Observations of task execution are recorded and analyzed.
21. Deviations from expected performance standards are identified.
22. Feedback is provided to workers in a constructive manner.
23. Areas for improvement are highlighted and documented.
24. Progress after feedback is tracked and reviewed.

Information Sheet- 5.1

Learning Outcome-1: Identify skill levels of workers.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 1.1 Workers' skill levels using a skills matrix.
- 1.2 Competencies required for each role
- 1.3 Gaps in skills and knowledge.

1.1 Workers' skill levels using a skills matrix.

A skills matrix is a tool used to assess and record workers' skill levels in different areas of work. It helps identify who can perform which task and at what level.

Key Areas Assessed in a Skills Matrix

Technical Skills	• Ability to operate machines • Knowledge of tools and equipment • Understanding of CNC programs and drawings
Operational Abilities	• Ability to set up machines • Handling materials and tools properly • Completing tasks within time
Safety Knowledge	• Understanding of safety rules • Use of personal protective equipment (PPE) • Emergency response awareness
Quality Standards	• Ability to measure and inspect workpieces • Understanding tolerances and specifications • Following standard operating procedures (SOP)

1.2 Competencies required for each role

Competencies are the knowledge, skills, and attitudes required to perform a specific job role effectively.

- Job-specific technical knowledge
- Machine operation skills
- Problem-solving ability
- Safety compliance
- Quality control understanding

Competencies ensure workers can perform tasks independently and correctly.

1.3 Gaps in skills and knowledge.

Skill gaps are the differences between required competencies and actual worker abilities.

Causes of Skill Gaps:	• Lack of training • Limited work experience • Technology updates • Poor understanding of SOP
Importance of Identifying Gaps:	• Helps plan training programs • Improves worker performance • Increases productivity and quality • Reduces errors and accidents

Self - Check - 5.1

Short Questions:

1. **Question:** What is a skills matrix?
Answer:
2. **Question:** Why is a skills matrix important in a workshop?
Answer:
3. **Question:** What are technical skills in a skills matrix?
Answer:
4. **Question:** What are operational abilities in worker assessment?
Answer:
5. **Question:** Why is safety knowledge included in a skills matrix?
Answer:
6. **Question:** What are competencies in a job role?
Answer:
7. **Question:** Why are competencies important for workers?
Answer:
8. **Question:** What is a skill gap?
Answer:

Answer Key - 5.1

Short Questions with Answer:

1. **Question:** What is a skills matrix?
Answer: A skills matrix is a tool used to assess and record workers' skill levels in different work areas.
2. **Question:** Why is a skills matrix important in a workshop?
Answer: It helps identify who can perform specific tasks and at what competency level.
3. **Question:** What are technical skills in a skills matrix?
Answer: Technical skills include machine operation, tool knowledge, and understanding CNC programs and drawings.
4. **Question:** What are operational abilities in worker assessment?
Answer: Operational abilities include machine setup, material handling, and completing tasks on time.
5. **Question:** Why is safety knowledge included in a skills matrix?
Answer: Safety knowledge ensures workers follow safety rules and use PPE correctly.
6. **Question:** What are competencies in a job role?
Answer: Competencies are the knowledge, skills, and attitudes required to perform a job effectively.
7. **Question:** Why are competencies important for workers?
Answer: Competencies ensure workers can perform tasks independently, accurately, and safely.
8. **Question:** What is a skill gap?
Answer: A skill gap is the difference between required competencies and a worker's actual ability.

Task Sheet- 5.1

Task Name: Identify Workers' Skill Levels and Skill Gaps Using a Skills Matrix.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.	
Working Procedure:	
▪ List all job roles in the department. ▪ Identify key tasks and required competencies for each role (technical, operational, safety, quality). ▪ Prepare a skills matrix table (Workers vs. Required Skills). ▪ Define clear skill levels (e.g., Level 1–Basic, Level 2–Intermediate, Level 3–Advanced). ▪ Observe workers performing assigned tasks. ▪ Review job records, experience, and past performance. ▪ Assess and record each worker's skill level in the matrix. ▪ Compare required competencies with actual skill levels. ▪ Identify gaps in skills and knowledge. ▪ Prepare a short report with findings and training recommendations. ▪ Submit the completed skills matrix and gap report to the supervisor.	
Specification Information:	
▪ Skill levels must be clearly defined and applied consistently. ▪ Assessment must be based on actual performance evidence. ▪ Required competencies must align with job descriptions. ▪ Skill gaps must clearly show required level vs. current level. ▪ Safety-related gaps must be prioritized. ▪ Training recommendations must be practical and specific. ▪ Final documents must be signed and properly recorded.	
Resources Required:	
Tools and materials:	● Skills matrix template (printed or digital) ● Pen / pencil ● Computer or laptop ● Spreadsheet software ● Calculator (if required) ● Standard Operating Procedures (SOP)

Information Sheet- 5.2

Learning Outcome-2: Set realistic production targets.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 2.1 Production targets.
- 2.2 Historical production data and performance trends.
- 2.3 Realistic timelines for achieving production goals.
- 2.4 Workforce capabilities and machine availability.

2.1 Production targets.

Production targets are the planned number of units or components to be produced within a specific time period (hour, shift, day, or month).

Purpose of Production Targets:

- Guide daily and monthly output
- Improve productivity and efficiency
- Meet customer delivery requirements
- Control production costs

Targets must be clear, measurable, and achievable.

2.2 Historical production data and performance trends.

Historical production data refers to past records of output, machine performance, and worker productivity.

Importance:

- Helps analyze previous performance
- Identifies strengths and weaknesses
- Shows patterns such as downtime, delays, or peak performance

Using past data ensures that targets are based on real performance, not assumptions.

2.3 Realistic timelines for achieving production goals.

A realistic timeline is a practical schedule for completing production tasks within available working hours.

Factors to Consider:

- Machine cycle time
- Setup time

- Tool change time
- Maintenance and downtime
- Worker efficiency

Unrealistic timelines may lead to:

- Worker stress
- Quality issues
- Safety risks

2.4 Workforce capabilities and machine availability.

Production planning must consider:

Workforce Capabilities:

- Skill level of operators
- Experience and training
- Ability to handle multiple tasks

Machine Availability:

- Number of operational machines
- Maintenance schedule
- Machine capacity and condition

Targets should match the actual capacity of workers and machines.

Self -Check - 5.2

Short Questions:

1. **Question:** What are production targets?
Answer:
2. **Question:** Why are production targets important?
Answer:
3. **Question:** What should production targets be like?
Answer:
4. **Question:** What is historical production data?
Answer:
5. **Question:** Why is historical production data important?
Answer:
6. **Question:** What is a realistic timeline in production?
Answer:
7. **Question:** What factors affect production timelines?
Answer:
8. **Question:** What can happen if timelines are unrealistic?
Answer:

Answer Key – 5.2

Short Questions with Answer:

1. **Question:** What are production targets?
Answer: Production targets are the planned number of units to be produced within a specific time period.
2. **Question:** Why are production targets important?
Answer: They guide output, improve productivity, meet delivery requirements, and control production costs.
3. **Question:** What should production targets be like?
Answer: They should be clear, measurable, and achievable.
4. **Question:** What is historical production data?
Answer: Historical production data is past records of output, machine performance, and worker productivity.
5. **Question:** Why is historical production data important?
Answer: It helps analyze past performance and set realistic future targets.
6. **Question:** What is a realistic timeline in production?
Answer: A realistic timeline is a practical schedule for completing production tasks within available working hours.
7. **Question:** What factors affect production timelines?
Answer: Factors include cycle time, setup time, tool change time, maintenance, and worker efficiency.
8. **Question:** What can happen if timelines are unrealistic?
Answer: It may cause worker stress, quality problems, and safety risks.

Task Sheet - 5.2

Task Name: Set Production Targets Based on Capacity, Historical Data, and Available Resources.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.	
Working Procedure:	
▪ Collect customer order quantity and delivery deadline. ▪ Review historical production data and past performance trends. ▪ Analyze machine cycle time and average daily output. ▪ Check setup time, tool change time, and expected downtime. ▪ Review workforce skill levels and availability. ▪ Confirm number of operational machines. ▪ Calculate realistic daily and shift production capacity. ▪ Set clear and measurable production targets (hourly/daily/monthly). ▪ Adjust targets based on machine availability and workforce capability. ▪ Prepare a production target plan with timeline. ▪ Submit the target plan for supervisor approval.	
Specification Information:	
▪ Targets must be specific, measurable, and time-bound. ▪ Historical data must be used to justify target numbers. ▪ Machine cycle time and setup time must be included in calculations. ▪ Maintenance and downtime must be considered. ▪ Workforce skill level must match production complexity. ▪ Targets must not exceed actual machine capacity. ▪ Timelines must allow safe and quality production. ▪ The final plan must align with customer delivery requirements. ▪ Production targets must be documented and approved.	
Resources Required:	
Tools and materials:	● Calculator ● Computer or laptop ● Spreadsheet software (e.g., Excel) ● Production planning template ● Pen / pencil ● Standard Operating Procedures (SOP) ● Workforce skill matrix

Information sheet- 5.3

Learning Outcome-3: Assign tasks based on worker skills capability.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 3.1 Worker capabilities using the skills matrix.
- 3.2 Assignments are documented and communicated clearly.
- 3.3 Task allocation to ensure balanced workload.

3.1 Worker capabilities using the skills matrix.

A skills matrix is a structured tool used to identify, evaluate, and record the skill levels of workers across different job functions. It helps supervisors assign tasks based on:

- Technical ability
- Operational efficiency
- Safety awareness
- Quality control knowledge

Purpose of Using a Skills Matrix	• Identify skilled, semi-skilled, and beginner workers • Match job complexity with worker capability • Reduce errors and rework • Improve productivity
Typical Skill Levels	• Level 1 – Beginner (needs supervision) • Level 2 – Intermediate (can perform with guidance) • Level 3 – Skilled (works independently) • Level 4 – Expert (can supervise and train others)
Key Skill Areas in CNC Environment	Technical Skills • Machine setup • CNC program loading • Tool selection and offset setting Operational Ability • Running production cycles • Monitoring machining • Handling tools and materials Safety Knowledge • PPE usage • Emergency procedures • Safe machine operation Quality Standards • Measuring workpieces • Understanding tolerances • Following SOP

3.2 Assignments are documented and communicated clearly.

Proper documentation ensures that task allocation is structured, traceable, and understood by all workers.

Importance of Documentation	• Avoids confusion and duplication of work • Ensures accountability • Provides reference for performance evaluation • Maintains transparency
Methods of Documentation	• Job assignment sheets • Production schedule boards • Digital production management systems • Shift briefing notes
Clear Communication	• Task description • Machine number • Quantity to produce • Timeline • Quality requirements

Clear communication reduces misunderstandings and improves workflow efficiency.

3.3 Task allocation to ensure balanced workload.

Balanced workload means distributing tasks fairly according to skill level, capacity, and machine availability.

Purpose of Balanced Allocation	• Prevent worker overload • Avoid machine idle time • Improve overall productivity • Maintain work quality
Factors to Consider	• Worker skill level • Job complexity • Production deadlines • Machine capacity • Shift duration
Risks of Poor Task Allocation	• Production delays • Quality defects • Worker fatigue • Safety risks
Balanced allocation ensures:	• Efficient use of human resources • Improved teamwork • Consistent production output

Self-check -5.3

Short Questions:

1. **Question:** Why is a skills matrix used in a CNC environment?
Answer:
2. **Question:** What are the typical skill levels in a skills matrix?
Answer:
3. **Question:** What technical skills are assessed in a CNC skills matrix?
Answer:
4. **Question:** What operational abilities are included in the skills matrix?
Answer:
5. **Question:** Why is documentation of assignments important?
Answer:
6. **Question:** What are common methods of documenting assignments?
Answer:
7. **Question:** What information must be clearly communicated in task assignments?
Answer:
8. **Question:** What is balanced workload in task allocation?
Answer:

Answer Key – 5.3

Short Questions with Answer:

1. **Question:** Why is a skills matrix used in a CNC environment?
Answer: It helps assign tasks based on technical ability, operational efficiency, safety awareness, and quality control knowledge.
2. **Question:** What are the typical skill levels in a skills matrix?
Answer: Level 1 – Beginner, Level 2 – Intermediate, Level 3 – Skilled, and Level 4 – Expert.
3. **Question:** What technical skills are assessed in a CNC skills matrix?
Answer: Machine setup, CNC program loading, and tool selection with offset setting.
4. **Question:** What operational abilities are included in the skills matrix?
Answer: Running production cycles, monitoring machining, and handling tools and materials.
5. **Question:** Why is documentation of assignments important?
Answer: It avoids confusion, ensures accountability, supports evaluation, and maintains transparency.
6. **Question:** What are common methods of documenting assignments?
Answer: Job assignment sheets, production schedule boards, digital systems, and shift briefing notes.
7. **Question:** What information must be clearly communicated in task assignments?
Answer: Task description, machine number, production quantity, timeline, and quality requirements.
8. **Question:** What is balanced workload in task allocation?
Answer: Balanced workload means distributing tasks fairly according to skill level, capacity, and machine availability.

Task Sheet- 5.3

Task Name: Assign Production Tasks According to Worker Skill Levels and Available Resources.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.	
Working Procedure:	
▪ Review the daily production plan and required output. ▪ Check the skills matrix to identify worker capability levels. ▪ Identify job complexity and required skill level. ▪ Match tasks with workers based on technical ability and experience. ▪ Consider machine availability and shift duration. ▪ Ensure beginner workers are assigned under supervision. ▪ Distribute workload evenly to avoid overload or idle time. ▪ Prepare job assignment sheet with task details. ▪ Communicate clearly to each worker (task, machine number, quantity, timeline, quality requirements). ▪ Display assignments on production board or digital system. ▪ Monitor performance and adjust allocation if necessary.	
Specification Information:	
▪ Technical requirements must match job complexity. ▪ Safety-sensitive tasks must be assigned to competent workers. ▪ Machine capacity and availability must be verified before assignment. ▪ Workload must be balanced across workers and machines. ▪ Documentation must include task description, machine number, quantity, and timeline. ▪ Communication must be clear and confirmed by workers. ▪ Allocation must support productivity, quality, and safety standards.	
Resources Required:	
Tools and materials:	• Skills matrix • Job assignment sheet format • Production schedule board • Computer or laptop • Spreadsheet / production management software • Pen / marker • Production order sheet • Standard Operating Procedures (SOP)

Information sheet- 5.4

Learning Outcome-4: Monitor performance and provide feedback.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 4.1 Worker performance.
- 4.2 Observations of task execution.
- 4.3 Deviations from expected performance standards.
- 4.4 Areas for improvement.

4.1 Worker performance.

Worker performance refers to how effectively and efficiently a worker completes assigned tasks according to quality standards, time targets, and safety requirements.

Key Aspects of Worker Performance

- Productivity (output per shift or hour)
- Quality of work (accuracy and defect rate)
- Adherence to SOP
- Safety compliance
- Team cooperation

Monitoring performance ensures that workers meet organizational and production goals.

4.2 Observations of task execution.

Observation means directly watching how a worker performs assigned tasks during operation.

Purpose of Observation

- Check correct machine setup and operation
- Ensure proper tool handling
- Confirm use of PPE
- Verify compliance with quality standards

Observation helps identify both:

- Strengths in performance
- Mistakes or unsafe practices

Regular monitoring supports continuous improvement.

4.3 Deviations from expected performance standards.

Deviation means any difference between actual performance and the expected standard.

Examples of Deviations

- Production output below target
- Dimensional inaccuracies
- Incorrect tool usage
- Ignoring safety procedures
- Excessive downtime

Causes of Deviations

- Lack of skill or training
- Poor machine condition
- Incorrect instructions
- Fatigue or overload

Early detection of deviations prevents:

- Production delays
- Increased rejection
- Safety risks

4.4 Areas for improvement.

Areas for improvement are specific aspects where performance does not meet required standards and needs development.

Common Improvement Areas	• Technical skill development • Time management • Quality inspection skills • Safety awareness • Communication and teamwork
Methods to Improve Performance	• On-the-job training • Coaching and mentoring • Skill upgrading programs • Clear performance feedback
Providing constructive feedback should be:	• Clear and specific • Based on facts • Focused on improvement, not blame

Self-check - 5.4

Short Questions:

1. **Question:** What is worker performance?
Answer:
2. **Question:** What are the key aspects of worker performance?
Answer:
3. **Question:** Why is monitoring worker performance important?
Answer:
4. **Question:** What is meant by observation of task execution?
Answer:
5. **Question:** What is the purpose of observing task execution?
Answer:
6. **Question:** What is a deviation from expected performance standards?
Answer:
7. **Question:** What are common examples of performance deviations?
Answer:
8. **Question:** What are common causes of deviations?
Answer:
9. **Question:** Why is early detection of deviations important?
Answer:
10. **Question:** What are areas for improvement in worker performance?
Answer:

Answer Key – 5.4

Short Questions with Answer:

1. **Question:** What is worker performance?
Answer: Worker performance refers to how effectively and efficiently a worker completes assigned tasks according to quality, time, and safety standards.
2. **Question:** What are the key aspects of worker performance?
Answer: Productivity, quality of work, adherence to SOP, safety compliance, and teamwork.
3. **Question:** Why is monitoring worker performance important?
Answer: It ensures workers meet production targets and organizational goals.
4. **Question:** What is meant by observation of task execution?
Answer: It means directly watching how a worker performs assigned tasks during operation.
5. **Question:** What is the purpose of observing task execution?
Answer: To check correct setup, proper tool handling, PPE usage, and compliance with quality standards.
6. **Question:** What is a deviation from expected performance standards?
Answer: A deviation is any difference between actual performance and the required standard.
7. **Question:** What are common examples of performance deviations?
Answer: Low production output, dimensional errors, incorrect tool use, ignoring safety rules, and excessive downtime.
8. **Question:** What are common causes of deviations?
Answer: Lack of skill, poor machine condition, incorrect instructions, and worker fatigue.
9. **Question:** Why is early detection of deviations important?
Answer: It prevents delays, rejection of parts, and safety risks.
10. **Question:** What are areas for improvement in worker performance?
Answer: Technical skills, time management, quality inspection skills, safety awareness, and communication.

Task sheet- 5.4

Task Name: Monitor Worker Performance and Provide Constructive Feedback for Improvement.

Instructions:	
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.	
Working Procedure:	
▪ Review daily production targets and quality standards. ▪ Observe workers during task execution. ▪ Check machine setup and operational process. ▪ Verify use of PPE and safety compliance. ▪ Compare actual output with production targets. ▪ Review product quality and defect rates. ▪ Identify deviations from expected standards. ▪ Analyze possible causes (skill gap, machine issue, unclear instruction). ▪ Record observations and findings. ▪ Provide clear and specific feedback to the worker. ▪ Suggest practical improvement actions (training, coaching, correction). ▪ Follow up and monitor progress regularly.	
Specification Information:	
▪ Observation must be based on actual task execution. ▪ Deviations must be clearly identified and documented. ▪ Causes of performance gaps must be analyzed before feedback. ▪ Safety-related deviations must be addressed immediately. ▪ Feedback must be factual, specific, and improvement-focused. ▪ Improvement areas must be clearly defined. ▪ Corrective actions must be practical and measurable. ▪ Follow-up monitoring must be conducted to ensure improvement.	
Resources Required:	
Tools and materials:	● Performance monitoring checklist ● Production report format ● Quality inspection checklist ● Observation sheet ● Computer or laptop ● Pen / marker ● Standard Operating Procedures (SOP)

Module-6

Module: Implementing Quality Control and Assurance Techniques

Unit Code: SICIP-LET-IPI-06-O

**Skills for Industry Competitiveness and Innovation Program (SICIP)
Finance Division, Ministry of Finance**

Module -6

Module Title: Implementing Quality Control and Assurance Techniques.

Unit code: SICIP-LET-IPI-06-0

Nominal hours: 20 Hrs.

Module Description: This module covers the skills, knowledge and attitudes required to implement quality control and assurance techniques. It specifically includes the task of identifying common defects, inspecting materials and products, applying standard operating procedures (SOPs) and recording and reporting quality deviations.

Learning Outcomes: After completing this module, the trainees will be able to:

1. Identify common defects.
2. Inspect materials and products.
3. Apply standard operating procedures (SOPs).
4. Record and report quality deviations.

Assessment Criteria:

1. Common defects in leather goods are identified and documented.
2. Common defects in footwear products are identified and documented.
3. Defective items are inspected visually and compared with quality standards.
4. Causes of defects related to materials, machines, or workmanship are recorded.
5. Defects are classified according to severity and production stage.
6. Findings are reported to relevant personnel for corrective action.
7. Materials used in production are identified and inspected for quality.
8. Products at various stages are inspected against Specifics and standards.
9. Defective or non-conforming materials and products are detected and recorded.
10. Inspection results are documented accurately for traceability.
11. Observations are compared with quality benchmarks and standards.
12. Issues detected during inspection are reported to relevant personnel.
13. Standard Operating Procedures (SOPs) are understood and explained.
14. SOPs are followed consistently during all relevant work activities.
15. Work processes are performed in compliance with established SOPs.
16. Deviations from SOPs are identified and reported.
17. SOPs are maintained and updated as required.
18. Compliance with SOPs is monitored and documented.
19. Basic quality tools are identified and used for inspection purposes.
20. Quality deviations in materials and products are recorded accurately.
21. Records are maintained according to established procedures.
22. Deviations from quality standards are documented with relevant details.
23. Quality reports are generated systematically and reviewed.
24. Reports are submitted to relevant personnel for corrective action.

Information Sheet- 6.1

Learning Outcome-1: Identify common defects.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 1.1 Common defects in leather goods.
- 1.2 Common defects in footwear products.
- 1.3 Causes of defects related to materials, machines, or workmanship.

1.1 Common defects in leather goods.

Leather goods production involves multiple departments. Defects may occur at any stage if proper standards are not followed.

Cutting Department

Defects in cutting directly affect material utilization and final product quality.

Misaligned Patterns	• Pattern placed incorrectly on leather • Leads to uneven shape and poor fitting
Uneven or Inaccurate Cuts	• Rough or jagged cutting edges • Causes difficulty during stitching
Wastage of Leather	• Poor nesting of patterns • Excessive material loss
Scratches or Cuts on Leather Surface	• Damage during handling or cutting • Affects product appearance
Skiving / Preparation Department	• Skiving prepares leather edges for folding or stitching.
Uneven Skiving Thickness	• Inconsistent thinning • Causes bulkiness or weak areas
Torn or Weakened Edges	• Excessive skiving pressure • Reduces durability
Wrinkles or Creases on Leather	• Improper handling • Affects smooth appearance

Stitching / Sewing Department

Stitching defects affect strength and appearance.

Loose, Skipped, or Uneven Stitches	• Irregular stitch formation • Weak seams
Thread Breakage	• Poor thread quality or wrong tension • Interrupted stitching
Misalignment of Parts During Sewing	• Panels not matched correctly • Distorted product shape

Assembling / Adhesive Department

Improper bonding affects durability and aesthetics.

Glue Marks on Visible Surfaces	• Excess adhesive application • Reduces product appearance
Improper Bonding of Components	• Weak adhesion • Parts may detach
Warping or Deformation	• Excess adhesive or uneven drying • Changes product shape

Finishing Department

Finishing defects affect final product presentation.

Uneven Coloring or Staining	• Poor dye application • Inconsistent color tone
Surface Cracks or Scratches	• Improper handling • Poor quality leather
Poor Edge Finishing	• Rough or uneven edges • Low-quality appearance
Improper Embossing or Stamping	• Faint or misaligned logo • Poor branding quality

1.2 Common defects in footwear products.

Footwear production has additional departments such as lasting and sole attachment.

Cutting Department	• Misaligned templates • Uneven cuts • Scratches on material • Material wastage
Stitching Department	• Loose or skipped stitches • Thread breakage • Misalignment of upper components
Lasting Department	• Poor Shaping of Upper • Improper stretching over last • Distorted shoe shape • Poor Shaping of Upper • Improper stretching over last • Distorted shoe shape • Uneven Tension or Wrinkles • Unequal pulling force • Affects comfort and appearance • Misalignment Between Upper and Sole • Improper positioning • Affects durability
Sole Preparation and Attaching	• Uneven sole thickness • Improper bonding or sole detachment • Glue marks on visible surfaces

Finishing Department	• Surface scratches or cracks • Color inconsistency • Poor edge finishing or polishing
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1.3 Causes of defects related to materials, machines, or workmanship.

Defects generally arise from three main sources:

Material-Related Causes	• Low-quality leather or fabric • Thickness variation • Surface defects in raw materials
Machine-Related Causes	• Incorrect machine settings • Worn or blunt cutting tools • Poor maintenance
Workmanship-Related Causes	• Lack of skill or training • Poor handling • Failure to follow SOP • Carelessness or fatigue

Self - Check - 6.1

Short Questions:

1. **Question:** In which department do misaligned patterns commonly occur in leather goods production?
Answer:
2. **Question:** What is the impact of uneven or inaccurate cuts in leather goods?
Answer:
3. **Question:** What defect can result from excessive skiving pressure?
Answer:
4. **Question:** What are common stitching defects in leather goods?
Answer:
5. **Question:** What causes glue marks on visible surfaces?
Answer:
6. **Question:** What finishing defect affects branding quality?
Answer:
7. **Question:** What defect may occur in the lasting department of footwear production?
Answer:
8. **Question:** What problem can arise from improper bonding of the sole?
Answer:

Answer Key - 6.1

Short Questions with Answer:

1. **Question:** In which department do misaligned patterns commonly occur in leather goods production?
Answer: Misaligned patterns commonly occur in the cutting department.
2. **Question:** What is the impact of uneven or inaccurate cuts in leather goods?
Answer: They create rough edges and cause difficulty during stitching.
3. **Question:** What defect can result from excessive skiving pressure?
Answer: Torn or weakened leather edges.
4. **Question:** What are common stitching defects in leather goods?
Answer: Loose, skipped, or uneven stitches and thread breakage.
5. **Question:** What causes glue marks on visible surfaces?
Answer: Excess adhesive application during assembling.
6. **Question:** What finishing defect affects branding quality?
Answer: Improper embossing or misaligned stamping.
7. **Question:** What defect may occur in the lasting department of footwear production?
Answer: Distorted shoe shape due to improper stretching over the last.
8. **Question:** What problem can arise from improper bonding of the sole?
Answer: Sole detachment or weak adhesion.

Task Sheet- 6.1

Task Name: Identify Common Defects in Leather Goods and Footwear Production.

Instructions:

Read and understand the directions carefully:

- This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement.
- This assessment activity will be used to measure your underpinning knowledge and skills
- You will have fifteen (15) minutes to familiarize yourself with the resources to be used
- You have one (1) hour to complete this demonstration.

Working Procedure:

- Review product quality standards and specifications.
- Inspect cutting department outputs for alignment and accuracy.
- Check skiving/preparation quality for thickness and edge condition.
- Examine stitching for stitch formation and seam strength.
- Inspect assembling and adhesive bonding quality.
- Check finishing quality including color, edges, and embossing.
- Inspect footwear-specific stages (lasting, sole attachment).
- Identify and classify defects by department.
- Determine possible causes (material, machine, workmanship).
- Record defects with clear description and evidence.
- Report findings to supervisor or quality manager.

Specification Information:

Leather Goods – Common Defects Must Include:

- **Cutting Department**
 - Misaligned patterns
 - Uneven or inaccurate cuts
 - Leather wastage
 - Surface scratches or damage
- **Skiving / Preparation**
 - Uneven skiving thickness
 - Torn or weakened edges
 - Wrinkles or creases
- **Stitching / Sewing**
 - Loose, skipped, or uneven stitches
 - Thread breakage
 - Misalignment of parts
- **Assembling / Adhesive**
 - Glue marks on visible areas
 - Improper bonding
 - Warping or deformation

- **Finishing**
 - Uneven coloring or staining
 - Surface cracks or scratches
 - Poor edge finishing
 - Improper embossing or stamping

Footwear – Common Defects Must Include:

- **Cutting**
 - Misaligned templates
 - Uneven cuts
 - Material scratches
- **Stitching**
 - Loose or skipped stitches
 - Thread breakage
 - Upper misalignment
- **Lasting**
 - Poor shaping of upper
 - Improper stretching
 - Distorted shoe shape
 - Uneven tension or wrinkles
 - Misalignment between upper and sole
- **Sole Preparation and Attaching**
 - Uneven sole thickness
 - Improper bonding or detachment
 - Visible glue marks
- **Finishing**
 - Surface scratches
 - Color inconsistency
 - Poor polishing or edge finishing

Resources Required:

Tools and materials:	● Defect inspection checklist ● Sample defective and approved products ● Measuring tools (ruler, caliper) ● Magnifying glass (if required) ● Camera or mobile for defect recording ● Pen and inspection report format ● Standard Operating Procedures (SOP)
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Information Sheet- 6.2

Learning Outcome-2: Inspect materials and products.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 2.1 Materials used in production.
- 2.2 Products at various stages.
- 2.3 Defective or non-conforming materials.
- 2.4 Inspection results.
- 2.5 Issues detected during inspection.

2.1 Materials used in production.

Materials used in production include all raw materials and components required to manufacture leather goods or footwear.

Common Materials

- Leather (full-grain, corrected, synthetic)
- Fabric or lining materials
- Foam and padding
- Thread and stitching materials
- Adhesives (glue)
- Soles and insoles
- Accessories (zippers, buckles, eyelets, logos)

Purpose of Material Inspection

- Ensure correct quality and thickness
- Check color consistency
- Confirm quantity and specification
- Prevent defects before production

Proper material inspection reduces production errors and waste.

2.2 Products at various stages.

Inspection is conducted at different production stages to maintain quality control.

Stages of Product Inspection

- After cutting
- After skiving/preparation
- After stitching
- After assembling or lasting
- Final product inspection

At each stage, products are checked for:

- Accuracy
- Alignment
- Strength
- Appearance

Stage-wise inspection helps detect defects early.

2.3 Defective or non-conforming materials.

Non-conforming materials are materials that do not meet required specifications or standards.

Examples

- Leather with cracks or deep scratches
- Incorrect thickness or size
- Wrong color shade
- Weak adhesive strength
- Damaged accessories

2.4 Inspection results.

Inspection results refer to the recorded outcome of the inspection process.

Possible Results

- Accepted (meets specification)
- Rework required
- Rejected (does not meet standards)

Results should be:

- Documented clearly
- Signed or approved by responsible authority
- Recorded for traceability

2.5 Issues detected during inspection.

Inspection may reveal different types of issues, such as:

- Surface defects
- Dimensional inaccuracies
- Stitching irregularities
- Poor bonding
- Color inconsistency

Identifying issues early helps:

- Prevent defective products reaching customers
- Reduce rework and cost
- Improve production process

Self -Check - 6.2

Short Questions:

1. **Question:** What are materials used in leather goods or footwear production?
Answer:
2. **Question:** Why is material inspection important before production?
Answer:
3. **Question:** At which stages is product inspection conducted?
Answer:
4. **Question:** What is checked during stage-wise inspection?
Answer:
5. **Question:** What are non-conforming materials?
Answer:
6. **Question:** Give two examples of defective materials.
Answer:
7. **Question:** Why must inspection results be documented?
Answer:
8. **Question:** What types of issues can be detected during inspection?
Answer:

Answer Key – 6.2

Short Questions with Answer:

1. **Question:** What are materials used in leather goods or footwear production?
Answer: Materials include leather, lining fabric, foam, thread, adhesives, soles, insoles, and accessories such as zippers and buckles.
2. **Question:** Why is material inspection important before production?
Answer: It ensures correct quality, thickness, color consistency, and specification to prevent defects and waste.
3. **Question:** At which stages is product inspection conducted?
Answer: Inspection is conducted after cutting, skiving, stitching, assembling or lasting, and during final product inspection.
4. **Question:** What is checked during stage-wise inspection?
Answer: Accuracy, alignment, strength, and overall appearance are checked at each stage.
5. **Question:** What are non-conforming materials?
Answer: Non-conforming materials are materials that do not meet required specifications or quality standards.
6. **Question:** Give two examples of defective materials.
Answer: Leather with cracks and incorrect thickness are examples of defective materials.
7. **Question:** Why must inspection results be documented?
Answer: Documentation ensures traceability, accountability, and quality control.
8. **Question:** What types of issues can be detected during inspection?
Answer: Surface defects, dimensional errors, stitching problems, poor bonding, and color inconsistency.

Task Sheet - 6.2

Task Name: Inspect Materials and Products at Different Stages of Production.

Instructions:
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.
Working Procedure:
▪ Review product specifications and quality standards. ▪ Inspect incoming raw materials for quality, thickness, and color consistency. ▪ Verify quantity and specification against purchase order. ▪ Separate non-conforming materials if found. ▪ Inspect products after cutting for accuracy and alignment. ▪ Check skiving/preparation quality for thickness and smoothness. ▪ Inspect stitching for seam strength and uniformity. ▪ Check assembling/lasting for proper bonding and shaping. ▪ Conduct final product inspection for appearance and finishing. ▪ Identify and classify any defects or non-conformities. ▪ Record inspection results (Accepted / Rework / Rejected). ▪ Report issues to the supervisor or quality manager.
Specification Information:
Material Inspection Must Include: • Correct type of leather (full-grain, corrected, synthetic) • Thickness within specified tolerance • Uniform color shade • No cracks, scratches, or surface damage • Strong adhesive quality • Accessories free from damage Stage-wise Product Inspection Must Cover: After Cutting • Accurate pattern alignment • Clean and even edges After Skiving / Preparation • Uniform thickness • No torn or weakened edges After Stitching • Even stitches • Proper thread tension • Correct panel alignment

After Assembling / Lasting

- Proper bonding
- Correct shape and alignment

Final Inspection

- Smooth surface
- Consistent color
- Clean finishing
- Proper logo/branding

Non-Conforming Materials Must Be:

- Clearly identified and separated
- Labeled as rejected or hold
- Reported to responsible authority

Inspection Results Must Be:

- Clearly documented
- Based on specification compliance
- Signed or approved by authorized personnel
- Recorded for traceability

Issues Detected During Inspection May Include:

- Surface defects
- Dimensional inaccuracies
- Stitching irregularities
- Poor bonding
- Color inconsistency

Resources Required:

Tools and materials:	• Inspection checklist • Measuring tools (ruler, caliper, thickness gauge) • Color shade reference chart • Adhesion testing tool (if required) • Magnifying glass • Pen and inspection report form • Product specifications and SOP
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Information sheet- 6.3

Learning Outcome-3: Apply standard operating procedures (SOPs).

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 3.1 Standard Operating Procedures (SOPs).
- 3.2 Work processes in compliance with established SOPs.
- 3.3 Deviations from SOPs.

3.1 Standard Operating Procedures (SOPs).

Standard Operating Procedures (SOPs) are written instructions that describe how a task must be performed in a consistent and safe manner. SOPs define:

- Step-by-step work methods
- Quality requirements
- Safety rules
- Responsibilities

Purpose of SOPs

- Ensure uniform work practices
- Maintain product quality
- Improve safety and efficiency
- Reduce errors and defects

3.2 Work processes in compliance with established SOPs.

Compliance means performing work exactly according to approved procedures.

Examples of Compliance

- Following correct cutting method
- Using proper machine settings
- Applying correct adhesive quantity
- Wearing required PPE
- Checking quality at defined stages

When work processes follow SOPs:

- Output remains consistent
- Production errors decrease
- Safety risks are minimized

3.3 Deviations from SOPs.

Deviation means any departure from the approved procedure.

Examples of Deviations

- Skipping inspection steps
- Using incorrect materials
- Ignoring safety precautions
- Changing machine settings without approval

Consequences of Deviations

- Increased defects
- Production delays
- Safety hazards
- Customer complaints

If deviation occurs, it must be:

- Reported immediately
- Investigated
- Corrected according to company policy

Self-check -6.3

Short Questions:

1. **Question:** What are Standard Operating Procedures (SOPs)?
Answer:

2. **Question:** What do SOPs define in a workplace?
Answer:

3. **Question:** What is the main purpose of SOPs?
Answer:

4. **Question:** What does compliance with SOPs mean?
Answer:

5. **Question:** Give examples of compliance with SOPs.
Answer:

6. **Question:** What happens when work processes follow SOPs?
Answer:

7. **Question:** What is a deviation from SOPs?
Answer:

Answer Key – 6.3

Short Questions with Answer:

1. **Question:** What are Standard Operating Procedures (SOPs)?
Answer: SOPs are written instructions that explain how a task must be performed in a consistent, safe, and approved manner.

2. **Question:** What do SOPs define in a workplace?
Answer: SOPs define step-by-step work methods, quality requirements, safety rules, and responsibilities.

3. **Question:** What is the main purpose of SOPs?
Answer: The main purpose of SOPs is to ensure uniform work practices, maintain quality, improve safety, and reduce errors.

4. **Question:** What does compliance with SOPs mean?
Answer: Compliance means performing work exactly according to the approved procedures and guidelines.

5. **Question:** Give examples of compliance with SOPs.
Answer: Following correct cutting methods, using proper machine settings, applying correct adhesive quantity, wearing PPE, and checking quality at defined stages.

6. **Question:** What happens when work processes follow SOPs?
Answer: Output remains consistent, production errors decrease, and safety risks are minimized.

7. **Question:** What is a deviation from SOPs?
Answer: A deviation is any departure from the approved procedure or standard method.

Task sheet- 6.3

Task Name: Apply Standard Operating Procedures in Production Activities.

Instructions:
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.
Working Procedure:
▪ Collect and review the relevant SOP for the assigned task. ▪ Understand work steps, quality requirements, and safety rules. ▪ Prepare tools, materials, and machine settings as per SOP. ▪ Wear required PPE before starting work. ▪ Perform the task strictly following the step-by-step procedure. ▪ Apply correct machine settings and material handling methods. ▪ Conduct quality checks at specified stages. ▪ Ensure work area remains clean and safe. ▪ Avoid unauthorized changes to process or materials. ▪ If any deviation occurs, stop work and inform the supervisor. ▪ Record work completion and inspection results.
Specification Information:
SOP Requirements Must Include: • Clear step-by-step work instructions • Defined quality standards • Approved machine settings • Safety precautions • Assigned responsibilities Work Must Comply with SOP by: • Following correct cutting, stitching, assembling, or finishing methods • Using specified materials only • Applying correct adhesive quantity • Maintaining proper machine parameters • Wearing mandatory PPE • Conducting inspections at required stages Deviations From SOP Must Be: • Clearly identified • Immediately reported • Documented using deviation form • Investigated to find root cause • Corrected before continuing production

Non-Compliance May Result In:

- Increased defects
- Production delays
- Safety risks
- Customer dissatisfaction

Resources Required:

Tools and materials:

- Approved SOP manual
- Work instruction sheets
- Machine setting guidelines
- PPE (gloves, mask, apron, safety shoes)
- Inspection checklist
- Deviation report form
- Pen and record file
- Approved product sample
- Quality specification documents

Information sheet- 6.4

Learning Outcome-4: Record and report quality deviations.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 4.1 Basic quality tools used for inspection purposes.
- 4.2 Quality deviations in materials and products.
- 4.3 Deviations from quality standards.
- 4.4 Quality reports.

4.1 Basic quality tools used for inspection purposes.

Quality tools are used to identify, analyze, and record defects or deviations during inspection.

Check Sheets	• Used to record defects systematically • Helps count frequency of specific problems
Control Charts	• Monitor process stability over time • Detect abnormal variations
Pareto Analysis	• Identifies major defects based on frequency • Follows the 80/20 principle (few causes create most problems)
Cause-and-Effect (Fishbone/Ishikawa) Diagram	• Identifies possible root causes of a problem • Categorizes causes (material, machine, method, manpower, etc.)
Flowcharts	• Show process steps visually • Help detect process gaps
Histogram	• Displays data distribution • Shows variation in measurements
Scatter Diagram	• Shows relationship between two variables • Helps identify correlation
5 Whys Analysis	• Root cause analysis by asking “Why?” repeatedly • Identifies the true source of a problem
Process Mapping	• Visual representation of the full process • Helps detect inefficiencies
Inspection Gauges and Measuring Tools	• Rulers, calipers, micrometers • Used for accurate dimensional measurement

4.2 Quality deviations in materials and products.

Quality deviation means any difference between actual quality and required standards.

Material Deviations

- Incorrect thickness
- Color variation
- Surface defects
- Weak adhesive quality

Product Deviations

- Dimensional inaccuracy
- Loose stitching
- Poor bonding
- Surface scratches

Early identification prevents further production defects.

4.3 Deviations from quality standards.

Deviation from quality standards occurs when products do not meet:

- Design specifications
- Tolerance limits
- Appearance standards
- Safety requirements

Such deviations must be:

- Identified
- Recorded
- Corrected

Failure to control deviations may result in rejection or customer complaints.

4.4 Quality reports.

A quality report is a documented record of inspection findings and deviations.

Contents of a Quality Report

- Product or batch details
- Type of defect
- Location of defect
- Quantity affected
- Root cause (if known)
- Corrective action taken

Self-check - 6.4

Short Questions:

1. **Question:** What are basic quality tools used for inspection?

Answer:

2. **Question:** What is a check sheet used for?

Answer:

3. **Question:** What is the purpose of a control chart?

Answer:

4. **Question:** What does Pareto analysis help identify?

Answer:

5. **Question:** What is a cause-and-effect diagram used for?

Answer:

6. **Question:** What is the function of a flowchart?

Answer:

7. **Question:** What does a histogram show?

Answer:

Answer Key – 6.4

Short Questions with Answer:

1. **Question:** What are basic quality tools used for inspection?
Answer: Basic quality tools are methods used to identify, analyze, and record defects or deviations during inspection.

2. **Question:** What is a check sheet used for?
Answer: A check sheet is used to record defects systematically and count the frequency of specific problems.

3. **Question:** What is the purpose of a control chart?
Answer: A control chart monitors process stability over time and detects abnormal variations.

4. **Question:** What does Pareto analysis help identify?
Answer: Pareto analysis identifies the major defects based on frequency using the 80/20 principle.

5. **Question:** What is a cause-and-effect diagram used for?
Answer: It identifies possible root causes of a problem by categorizing them such as material, machine, method, and manpower.

6. **Question:** What is the function of a flowchart?
Answer: A flowchart visually shows process steps and helps detect process gaps.

7. **Question:** What does a histogram show?
Answer: A histogram displays data distribution and shows variation in measurements.

Task sheet- 6.4

Task Name: Use Basic Quality Tools to Record and Report Quality Deviations.

Instructions:
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.
Working Procedure:
▪ Review quality standards and product specifications. ▪ Inspect materials and products using measuring tools. ▪ Identify any deviation from required standards. ▪ Record defects systematically using a check sheet. ▪ Classify defects (material, machine, method, manpower). ▪ Use Pareto analysis to identify major defect types. ▪ Apply 5 Whys or Fishbone diagram to analyze root cause. ▪ Use control charts (if applicable) to check process stability. ▪ Separate and label non-conforming products. ▪ Prepare a quality report with all findings. ▪ Recommend corrective action based on analysis. ▪ Submit report to supervisor or quality manager.
Specification Information:
Basic Quality Tools Must Be Used Appropriately: • Check Sheets – Record defect frequency clearly. • Control Charts – Monitor variation and stability. • Pareto Analysis – Identify major defects using 80/20 principle. • Fishbone Diagram – Identify possible root causes. • Flowcharts / Process Mapping – Detect process gaps. • Histogram – Show data variation. • Scatter Diagram – Identify relationship between variables. • 5 Whys – Determine true root cause. • Inspection Gauges – Ensure accurate measurements. Quality Deviations Must Include: Material Deviations • Incorrect thickness • Color variation • Surface defects • Weak adhesive strength Product Deviations • Dimensional inaccuracy • Loose or uneven stitching • Poor bonding

- Surface scratches

Deviation From Quality Standards Must Be:

- Compared against design specifications
- Checked within tolerance limits
- Verified against appearance and safety requirements
- Clearly recorded and classified

Quality Report Must Contain:

- Product or batch details
- Type and description of defect
- Location of defect
- Quantity affected
- Root cause analysis
- Corrective action taken
- Signature of responsible authority

Resources Required:

Tools and materials:	• Check sheet format • Control chart template • Pareto chart format • Fishbone (Cause-and-Effect) diagram template • Flowchart / process map format • 5 Whys analysis sheet • Histogram / scatter diagram template (if required) • Measuring tools (ruler, caliper, micrometer) • Computer or laptop • Camera (for defect evidence)
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Module-7

Module: Monitoring and Evaluating Productivity Performance

Unit Code: SICIP-LET-IPI-07-O

**Skills for Industry Competitiveness and Innovation Program (SICIP)
Finance Division, Ministry of Finance**

Module -7

Module Title: Monitoring and Evaluating Productivity Performance.

Unit code: SICIP-LET-IPI-07-0

Nominal hours: 30 Hrs.

Module Description: This module covers the skills, knowledge and attitudes required to monitor and evaluate productivity performance. It specifically includes the task of collecting data on production, calculating key productivity indicators, comparing performance against set targets, identifying causes of underperformance and preparing reports and suggest improvement actions.

Learning Outcomes: After completing this module, the trainees will be able to:

1. Collect data on production.
2. Calculate key productivity indicators.
3. Compare performance against set targets.
4. Identify causes of underperformance.
5. Prepare reports and suggest improvement actions.

Assessment Criteria:

1. Production data requirements are identified and documented.
2. Data on output, labor hours, and machine utilization are collected accurately.
3. Standardized data collection methods and tools are applied.
4. Collected data is verified for accuracy and completeness.
5. Variations between planned and actual production are recorded.
6. Data is organized systematically for analysis and reporting.
7. Key productivity indicators relevant to the leather and footwear sector are identified.
8. Data on input and output variables is analyzed for calculation.
9. Labor, machine, and material productivity are computed using standard formulas.
10. Calculated indicators are compared with industry benchmarks or targets.
11. Deviations in productivity performance are identified and recorded.
12. Calculations are verified to ensure accuracy and reliability.
13. Set productivity targets and benchmarks are reviewed and documented.
14. Actual performance data is compared with planned targets.
15. Variations and gaps in performance are identified and analyzed.
16. Causes of underperformance or improvement are recorded.
17. Comparison results are summarized and reported to relevant personnel.
18. Corrective and preventive measures are suggested based on findings.
19. Areas of underperformance are identified through analysis of productivity data.
20. Contributing factors are examined.
21. Data from production and quality records is reviewed to detect inefficiencies.
22. Root causes of low performance are analyzed using appropriate tools and techniques.
23. Causes of underperformance are documented systematically.
24. Reports are reviewed and approved by management or relevant personnel.
25. Recommendations are communicated to concerned departments for implementation.
26. Records of reports and improvement actions are maintained for follow-up and evaluation.

Information Sheet- 7.1

Learning Outcome-1: Collect data on production.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 1.1 Production data requirements.
- 1.2 Standardized data collection methods and tools.
- 1.3 Variations between planned and actual production.

1.1 Production data requirements.

Production data refers to the information collected during manufacturing to monitor performance, productivity, and quality.

Data Types

Output

- Number of units produced
- Measured per hour, shift, or day
- Indicates productivity level

Downtime

- Time when machine or worker is not producing
- Includes breakdown, setup delay, waiting time

Defects

- Number of defective or rejected items
- Used to monitor quality performance

Material Usage

- Quantity of raw material consumed
- Helps control wastage and cost

Data Sources

Production data can come from different sources:

Operators

- Report output, downtime, and issues

Machines

- Machine counters, sensors, or CNC systems
- Provide automated production data

Supervisors

- Monitor attendance, workflow, and performance

Data Collection Frequency

Data must be collected regularly for accuracy.

Hourly

- Real-time monitoring
- Detect immediate issues

Daily

- Review daily production performance

Weekly

- Analyze trends and overall performance

1.2 **Standardized data collection methods and tools.**

Standardized data collection methods and tools.

Collection Methods

Manual

- Written records by operators
- Simple and low-cost

Digital

- Data entered into computer systems
- Faster and more organized

Automated

- Collected directly from machines or sensors
- Reduces human error

Data Collection Tools

Checklists

- Structured forms to record data

Logbooks

- Daily record books for production tracking

Apps

- Mobile applications for real-time data entry

Software

- Production management systems
- ERP or monitoring software

1.3 Variations between planned and actual production.

Variation means the difference between expected performance and actual results.

Planned vs. Actual Output

- Compare target quantity with actual production

Planned vs. Actual Labor Hours

- Compare planned workforce hours with actual attendance

Planned vs. Actual Machine Uptime

- Compare expected running time with actual working time

Causes of Variation

Machine Breakdown

- Mechanical or technical failure

Material Delay

- Late arrival of raw materials

Absenteeism

- Worker absence affecting productivity

Deviation Percentage

Deviation percentage measures the gap between planned and actual results.

Formula (conceptually):

$$\text{Deviation \%} = (\text{Difference} \div \text{Planned Value}) \times 100$$

It helps evaluate performance level.

Reporting Schedule

Production reports should be prepared:

- Daily production summary
- Weekly performance review
- Monthly performance analysis

Regular reporting supports:

- Decision-making
- Problem identification
- Continuous improvement

Self - Check - 7.1

Short Questions:

1. **Question:** What is production data?
Answer:
2. **Question:** What type of data shows productivity level?
Answer:
3. **Question:** What does variation in production mean?
Answer:
4. **Question:** How is planned vs. actual output compared?
Answer:
5. **Question:** What causes production variation?
Answer:
6. **Question:** What is manual data collection?
Answer:
7. **Question:** What is digital data collection?
Answer:
8. **Question:** What is automated data collection?
Answer:

Answer Key - 7.1

Short Questions with Answer:

1. **Question:** What is production data?
Answer: Production data is information collected during manufacturing to monitor productivity, performance, and quality.
2. **Question:** What type of data shows productivity level?
Answer: Output data, such as the number of units produced per hour, shift, or day.
3. **Question:** What does variation in production mean?
Answer: Variation is the difference between planned targets and actual production results.
4. **Question:** How is planned vs. actual output compared?
Answer: By comparing target quantity with actual produced quantity.
5. **Question:** What causes production variation?
Answer: Machine breakdown, material delays, absenteeism, or operational issues.
6. **Question:** What is manual data collection?
Answer: Manual data collection involves written records maintained by operators.
7. **Question:** What is digital data collection?
Answer: Digital data collection involves entering production data into computer systems.
8. **Question:** What is automated data collection?
Answer: Automated data collection gathers data directly from machines or sensors, reducing human error.

Task Sheet- 7.1

Task Name: Collect and Record Production Data Accurately.

Instructions:
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.
Working Procedure:
▪ Review daily production plan and target quantities. ▪ Collect output data (units produced per hour/shift/day). ▪ Record machine downtime and reasons (breakdown, setup delay, waiting). ▪ Record number of defective or rejected items. ▪ Record quantity of raw materials used. ▪ Verify data from operators, machine counters, and supervisors. ▪ Enter collected data into logbook or digital system. ▪ Compare planned output with actual production. ▪ Calculate variation and deviation percentage. ▪ Identify causes of variation (machine, material, manpower). ▪ Prepare daily production summary report. ▪ Submit report to supervisor or production manager.
Specification Information:
1. Production Data Must Include: Output • Units produced per hour, shift, or day • Compared with target quantity Downtime • Machine breakdown time • Setup delay • Waiting time Defects • Number of rejected items • Defect type and frequency Material Usage • Quantity consumed • Comparison with standard usage 2. Data Collection Must Be: • Accurate and based on actual records • Collected regularly (hourly, daily, weekly) • Verified from reliable sources (operators, machines, supervisors) • Recorded using standardized formats

3. Variation Analysis Must Include:

- Planned vs. actual output
- Planned vs. actual labor hours
- Planned vs. actual machine uptime
- Deviation percentage calculation

Concept:

Deviation % = (Difference ÷ Planned Value) × 100

4. Reporting Must Be:

- Prepared daily for immediate review
- Analyzed weekly for performance trends
- Summarized monthly for management decision-making
- Clear, structured, and properly documented

Resources Required:

Tools and materials:	• Production data collection sheet • Downtime recording format • Defect recording checklist • Calculator • Computer or laptop • Production management software / ERP (if available) • Mobile app (if used) • Pen and logbook
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Information Sheet- 7.2

Learning Outcome-2: Calculate key productivity indicators.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 2.1 Key productivity indicators relevant to the leather and footwear sector.
- 2.2 Data on input and output variables.
- 2.3 Standard formulas for labor, machine and materials productivity.
- 2.4 Deviations in productivity performance.

2.1 Key productivity indicators relevant to the leather and footwear sector.

Productivity indicators are measures used to evaluate production efficiency and performance.

Common Productivity Indicators

- Labor Productivity
- Machine Productivity
- Material Productivity
- Defect Rate
- Efficiency Percentage
- Downtime Rate

These indicators help measure how effectively inputs (labor, machines, materials) are converted into output (finished products).

2.2 Data on input and output variables.

To calculate productivity, accurate input and output data are required.

Input Variables

- Number of workers
- Labor hours worked
- Machine hours available
- Quantity of raw materials used
- Production cost

Output Variables

- Number of finished products
- Acceptable (good) products
- Production value

Productivity compares output results with input resources used.

2.3 Standard formulas for labor, machine and materials productivity.

Labor Productivity

Labor Productivity =
 $\text{Output} \div \text{Total Labor Hours}$

Example:

- If 200 pairs of shoes are produced in 40 labor hours:
 $\text{Labor Productivity} = 200 \div 40 = 5 \text{ units per labor hour}$

Machine Productivity

Machine Productivity =
 $\text{Output} \div \text{Machine Hours Used}$
Indicates how efficiently machines are utilized.

Material Productivity

Material Productivity =
 $\text{Output} \div \text{Material Used}$
Helps measure wastage and efficiency of raw material use.

Defect Rate (Quality Indicator)

Defect Rate (%) =
 $(\text{Number of Defective Units} \div \text{Total Units Produced}) \times 100$
Lower defect rate means better quality performance.

2.4 Deviations in productivity performance.

Deviation means the difference between planned productivity and actual productivity.
Causes of Productivity Deviations.

- Machine breakdown
- Poor worker performance
- Material shortage
- High defect rate
- Inefficient workflow

Importance of Monitoring Deviations

- Identifies weak areas
- Supports corrective action
- Improves efficiency and cost control
- Enhances competitiveness

Self -Check - 7.2

Short Questions:

1. **Question:** What are productivity indicators?
Answer:
2. **Question:** Name common productivity indicators used in leather and footwear production.
Answer:
3. **Question:** Why are productivity indicators important?
Answer:
4. **Question:** What are input variables in productivity calculation?
Answer:
5. **Question:** What are output variables in productivity calculation?
Answer:
6. **Question:** Why is accurate data important for productivity calculation?
Answer:
7. **Question:** What is the formula for labor productivity?
Answer:
8. **Question:** If 200 pairs of shoes are produced in 40 labor hours, what is the labor productivity?
Answer:
9. **Question:** What is the formula for machine productivity?
Answer:
10. **Question:** What is productivity deviation?
Answer:

Answer Key – 7.2

Short Questions with Answer:

1. **Question:** What are productivity indicators?
Answer: Productivity indicators are measures used to evaluate production efficiency and overall performance.
2. **Question:** Name common productivity indicators used in leather and footwear production.
Answer: Labor productivity, machine productivity, material productivity, defect rate, efficiency percentage, and downtime rate.
3. **Question:** Why are productivity indicators important?
Answer: They measure how effectively labor, machines, and materials are converted into finished products.
4. **Question:** What are input variables in productivity calculation?
Answer: Input variables include number of workers, labor hours, machine hours, raw materials used, and production cost.
5. **Question:** What are output variables in productivity calculation?
Answer: Output variables include number of finished products, acceptable products, and production value.
6. **Question:** Why is accurate data important for productivity calculation?
Answer: Accurate data ensures correct measurement of efficiency and performance.
7. **Question:** What is the formula for labor productivity?
Answer: Labor Productivity = $\text{Output} \div \text{Total Labor Hours}$.
8. **Question:** If 200 pairs of shoes are produced in 40 labor hours, what is the labor productivity?
Answer: 5 units per labor hour.
9. **Question:** What is the formula for machine productivity?
Answer: Machine Productivity = $\text{Output} \div \text{Machine Hours Used}$.
10. **Question:** What is productivity deviation?
Answer: Productivity deviation is the difference between planned productivity and actual productivity.

Task Sheet - 7.2

Task Name: Calculate and Analyze Productivity Indicators in Leather and Footwear Production.

Instructions:

Read and understand the directions carefully:

- This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement.
- This assessment activity will be used to measure your underpinning knowledge and skills
- You will have fifteen (15) minutes to familiarize yourself with the resources to be used
- You have one (1) hour to complete this demonstration.

Working Procedure:

Collect production output data (total units produced).
 Collect input data (labor hours, machine hours, material used).
 Verify data accuracy from records and supervisors.
 Calculate labor productivity (Output ÷ Labor Hours).
 Calculate machine productivity (Output ÷ Machine Hours).
 Calculate material productivity (Output ÷ Material Used).
 Calculate defect rate percentage.
 Compare actual productivity with planned targets.
 Identify deviations in productivity performance.
 Analyze possible causes of deviation.
 Prepare a productivity performance report.
 Submit report to production supervisor or manager.

Specification Information:

1. Key Productivity Indicators Must Include:

- Labor Productivity
- Machine Productivity
- Material Productivity
- Defect Rate (%)
- Efficiency Percentage
- Downtime Rate

2. Input Variables Must Include:

- Number of workers
- Total labor hours worked
- Machine hours used
- Quantity of materials consumed
- Production cost (if required)

3. Output Variables Must Include:

- Total units produced
- Acceptable (good) units
- Production value

4. Standard Formulas

Labor Productivity

Output ÷ Total Labor Hours

Machine Productivity

Output ÷ Machine Hours Used

Material Productivity

Output ÷ Material Used

Defect Rate (%)

(Number of Defective Units ÷ Total Units Produced) × 100

5. Deviations in Productivity Must Be:

- Compared with planned targets
- Measured in percentage or unit difference
- Analyzed for root causes

Common Causes of Deviation:

- Machine breakdown
- Low worker efficiency
- Material shortage
- High defect rate
- Poor workflow organization

6. Monitoring Productivity Supports:

- Performance evaluation
- Cost control
- Process improvement
- Competitive production efficiency

Resources Required:

Tools and materials:

- Calculator
- Productivity calculation sheet
- Computer or laptop
- Spreadsheet software (e.g., Excel)
- Production data report format
- Pen and notebook

Information sheet- 7.3

Learning Outcome-3: Compare performance against set targets.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 3.1 Set productivity targets and benchmarks.
- 3.2 Actual performance data.
- 3.3 Variations and gaps in performance.
- 3.4 Causes of underperformance or improvement.
- 3.5 Corrective and preventive measures.

3.1 Set productivity targets and benchmarks.

Productivity targets are planned performance goals set for production within a specific time period. Benchmarks are standard reference values used to measure performance.

Planned Output Targets

Targets must be realistic and measurable.

Daily Targets

- Number of units to be produced per day
- Helps monitor short-term performance

Weekly Targets

- Aggregated production for the week
- Tracks consistency

Monthly Targets

- Long-term production planning
- Linked to sales and delivery commitments

Standard Productivity Levels

Standard levels define expected efficiency.

Labor Productivity

- Output per labor hour

Machine Productivity

- Output per machine hour

Material Productivity

- Output per unit of material used
- These standards help determine whether production is efficient.

Industry or Enterprise Benchmarks

Benchmarks are performance standards based on:

- Industry averages
- Company historical data
- Best-performing production lines

They help compare internal performance with external standards.

Historical Performance Data

Past production data helps:

- Identify trends
- Detect recurring problems
- Set realistic future targets

Customer or Buyer Standards

Customers may specify:

- Quality tolerance
- Delivery time
- Defect rate limits

Meeting buyer standards is essential for business continuity.

3.2 Actual performance data.

Actual performance data refers to real production results collected from:

- Daily output records
- Labor hour reports
- Machine usage logs
- Quality inspection reports

This data is used to compare with planned targets.

3.3 Variations and gaps in performance.

Variation means the difference between planned targets and actual results.

Performance Gap =

Planned Target – Actual Performance

Gaps may indicate:

- Underperformance
- Process inefficiency
- Quality problems

3.4 Causes of underperformance or improvement.

Causes of Underperformance

Machine Downtime

- Equipment failure
- Maintenance delay

Low Worker Efficiency

- Lack of skill
- Fatigue
- Poor supervision

Poor Material Quality

- Defective raw materials
- Inconsistent thickness or quality

Unbalanced Workflow or Delays

- Bottlenecks
- Poor task allocation

Causes of Improvement

Improved Process or Training

- Better workflow planning
- Skill upgrading
- Preventive maintenance
- Process optimization

3.5 Corrective and preventive measures.

Corrective measures address existing problems.
Preventive measures stop problems from recurring.

Examples:

- Repair and maintain machines
- Provide worker training
- Improve material inspection
- Balance workload
- Review and update SOP

Self-check -7.3

Short Questions:

1. **Question:** What are productivity targets?
Answer:
2. **Question:** What is a benchmark?
Answer:
3. **Question:** What is the purpose of daily production targets?
Answer:
4. **Question:** Why are weekly and monthly targets important?
Answer:
5. **Question:** What is actual performance data?
Answer:
6. **Question:** Why is actual performance data collected?
Answer:
7. **Question:** What does variation mean in production performance?
Answer:
8. **Question:** How is performance gap calculated?
Answer:
9. **Question:** What are common causes of underperformance?
Answer:
10. **Question:** What is the difference between corrective and preventive measures?
Answer:

Answer Key – 7.3

Short Questions with Answer:

1. **Question:** What are productivity targets?
Answer: Productivity targets are planned performance goals set for production within a specific time period.
2. **Question:** What is a benchmark?
Answer: A benchmark is a standard reference value used to measure and compare performance.
3. **Question:** What is the purpose of daily production targets?
Answer: Daily targets help monitor short-term production performance.
4. **Question:** Why are weekly and monthly targets important?
Answer: Weekly targets track consistency, while monthly targets support long-term planning and delivery commitments.
5. **Question:** What is actual performance data?
Answer: It is the real production result collected from output records, labor reports, machine logs, and quality reports.
6. **Question:** Why is actual performance data collected?
Answer: It is used to compare with planned targets and evaluate performance.
7. **Question:** What does variation mean in production performance?
Answer: Variation is the difference between planned targets and actual results.
8. **Question:** How is performance gap calculated?
Answer: Performance Gap = Planned Target minus Actual Performance.
9. **Question:** What are common causes of underperformance?
Answer: Machine downtime, low worker efficiency, poor material quality, and unbalanced workflow.
10. **Question:** What is the difference between corrective and preventive measures?
Answer: Corrective measures fix existing problems, while preventive measures stop problems from recurring.

Task sheet- 7.3

Task Name: Compare Actual Production Performance with Set Targets and Recommend Actions.

Instructions:
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.
Working Procedure:
Review daily, weekly, or monthly production targets. Confirm standard productivity levels (labor, machine, material). Collect actual performance data from production records. Verify accuracy of output, labor hours, and machine usage. Compare planned targets with actual performance. Calculate performance gap (Target – Actual). Identify percentage variation where required. Analyze trends using historical performance data. Check compliance with customer or buyer standards. Identify causes of underperformance or improvement. Recommend corrective and preventive measures. Prepare and submit performance comparison report.
Specification Information:
1. Productivity Targets Must Include: • Daily output targets • Weekly production totals • Monthly production goals • Standard labor productivity (output per labor hour) • Standard machine productivity (output per machine hour) • Standard material productivity Benchmarks must be based on: • Company historical data • Best-performing lines • Industry standards • Customer requirements 2. Actual Performance Data Must Include: • Total units produced • Labor hours worked • Machine hours used • Defect rate • Material usage • Downtime records

3. Performance Gap Calculation:

Performance Gap = Planned Target – Actual Performance

Variation must be expressed in:

- Unit difference
- Percentage difference

4. Causes of Underperformance May Include:

- Machine breakdown or downtime
- Low worker efficiency
- Poor material quality
- Workflow bottlenecks
- High defect rate

5. Causes of Improvement May Include:

- Process optimization
- Worker training and skill upgrading
- Preventive maintenance
- Better supervision
- Balanced task allocation

6. Corrective and Preventive Measures Must Be:

- Clearly defined
- Practical and achievable
- Focused on root causes
- Documented and monitored

Resources Required:

Tools and materials:	• Productivity calculation sheet • Performance comparison format • Calculator • Computer or laptop • Spreadsheet software (e.g., Excel) • Performance dashboard (if available) • Pen and report file • Production target sheet (daily/weekly/monthly) • Historical production data
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Information sheet- 7.4

Learning Outcome-4: Identify causes of underperformance.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 4.1 Areas of underperformance of productivity data.
- 4.2 Contributing factors.
- 4.3 Data from production and quality records.
- 4.4 Root causes of low performance using appropriate tools and techniques.
- 4.5 Causes of underperformance.

4.1 Areas of underperformance of productivity data.

Underperformance occurs when actual production results are below planned targets. Common areas of underperformance include:

- Low daily or weekly output
- High defect rate
- Increased downtime
- Excessive material wastage
- Low labor efficiency
- Low machine utilization

Identifying the specific area helps focus on corrective action.

4.2 Contributing factors.

Contributing factors are conditions that negatively affect productivity.

Examples:

- Machine breakdown or poor maintenance
- Lack of worker skills or training
- Material shortages or poor material quality
- Poor supervision or communication
- Unbalanced workload
- Inefficient workflow layout

These factors reduce efficiency and increase production delays.

4.3 Data from production and quality records.

Accurate data helps identify performance problems.

Production Records Include:

- Output reports
- Downtime logs
- Labor hour reports
- Machine usage reports

Quality Records Include:

- Defect reports
- Rework data
- Inspection reports
- Customer complaints

Analyzing these records helps detect patterns and recurring issues.

4.4 Root causes of low performance using appropriate tools and techniques.

Root cause analysis identifies the main reason behind underperformance, not just symptoms.

Common Tools and Techniques:

- 5 Whys Analysis
- Cause-and-Effect (Fishbone) Diagram
- Pareto Analysis
- Process Mapping
- Control Charts

These tools help trace problems back to their origin.

4.5 Causes of underperformance.

Major causes may include:

- Machine downtime
- Low worker efficiency
- Poor material quality
- High defect rate
- Lack of proper planning
- Weak supervision
- Poor communication
- Absenteeism

Self-check - 7.4

Short Questions:

1. **Question:** What is underperformance in production?
Answer:
2. **Question:** What are common areas of underperformance?
Answer:
3. **Question:** What are contributing factors in underperformance?
Answer:
4. **Question:** Give examples of contributing factors.
Answer:
5. **Question:** Why is production data important in identifying underperformance?
Answer:
6. **Question:** What information is included in production records?
Answer:
7. **Question:** What is root cause analysis?
Answer:
8. **Question:** Which tools are used for root cause analysis?
Answer:
9. **Question:** What are major causes of underperformance?
Answer:
10. **Question:** Why must causes of underperformance be identified clearly?
Answer:

Answer Key – 7.4

Short Questions with Answer:

1. **Question:** What is underperformance in production?
Answer: Underperformance occurs when actual production results are below planned targets.
2. **Question:** What are common areas of underperformance?
Answer: Low output, high defect rate, increased downtime, excessive material wastage, low labor efficiency, and low machine utilization.
3. **Question:** What are contributing factors in underperformance?
Answer: Contributing factors are conditions that negatively affect productivity.
4. **Question:** Give examples of contributing factors.
Answer: Machine breakdown, lack of worker skills, poor material quality, poor supervision, unbalanced workload, and inefficient workflow layout.
5. **Question:** Why is production data important in identifying underperformance?
Answer: It provides evidence to analyze output levels, downtime, and labor efficiency.
6. **Question:** What information is included in production records?
Answer: Output reports, downtime logs, labor hour reports, and machine usage reports.
7. **Question:** What is root cause analysis?
Answer: Root cause analysis identifies the main reason behind underperformance rather than just symptoms.
8. **Question:** Which tools are used for root cause analysis?
Answer: 5 Whys analysis, fishbone diagram, Pareto analysis, process mapping, and control charts.
9. **Question:** What are major causes of underperformance?
Answer: Machine downtime, low worker efficiency, poor material quality, high defect rate, poor planning, weak supervision, poor communication, and absenteeism.
10. **Question:** Why must causes of underperformance be identified clearly?
Answer: Clear identification supports proper corrective and preventive measures to improve productivity.

Task Sheet- 7.4

Task Name: Identify and Analyze Causes of Underperformance in Production.

Instructions:
Read and understand the directions carefully: ▪ This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement. ▪ This assessment activity will be used to measure your underpinning knowledge and skills ▪ You will have fifteen (15) minutes to familiarize yourself with the resources to be used ▪ You have one (1) hour to complete this demonstration.
Working Procedure:
Review planned production targets and benchmarks. Compare actual performance with targets. Identify specific areas of underperformance (output, defect rate, downtime, etc.). Collect relevant production and quality records. Analyze data to detect patterns or recurring issues. Classify contributing factors (machine, manpower, material, method). Use 5 Whys or Fishbone diagram to determine root causes. Apply Pareto analysis to identify major problem areas. Confirm root causes with supporting data. Document findings clearly in an analysis report. Recommend corrective and preventive actions. Submit report to supervisor or management for decision-making.
Specification Information:
1. Areas of Underperformance Must Be Identified In: • Low daily or weekly output • High defect rate • Increased downtime • Excessive material wastage • Low labor productivity • Low machine utilization 2. Contributing Factors May Include: • Machine breakdown or poor maintenance • Lack of worker skills or training • Poor material quality or shortage • Weak supervision or communication • Unbalanced workload • Inefficient workflow layout 3. Data Analysis Must Use: Production Records • Output reports • Downtime logs • Labor hour reports

- Machine usage data

Quality Records

- Defect reports
- Rework records
- Inspection reports
- Customer complaints

4. Root Cause Analysis Tools Must Be Applied:

- 5 Whys Analysis
- Cause-and-Effect (Fishbone) Diagram
- Pareto Analysis
- Process Mapping
- Control Charts

Root cause must be supported by factual data, not assumptions.

5. Major Causes of Underperformance May Include:

- Machine downtime
- Low worker efficiency
- High defect rate
- Poor material quality
- Lack of proper planning
- Absenteeism
- Weak supervision
- Poor communication

Resources Required:

Tools and materials:	• Performance comparison sheet • Root cause analysis format (5 Whys template) • Fishbone diagram template • Pareto chart format • Process mapping sheet • Control chart template (if required) • Calculator • Computer or laptop • Pen and report file • SOP documents
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Information sheet- 7.5

Learning Outcome-5: Prepare reports and suggest improvement actions.

Learning Objective: After completion of this information sheet, the learners will be able to explain, define and interpret the following contents.

Contents:

- 5.1 Prepare Reports.
- 5.2 Recommendations to concerned departments for implementation.

5.1 Prepare Reports.

A report is a formal document that presents production data, performance results, and identified issues in a clear and structured manner.

Purpose of Reports

- Communicate performance results
- Highlight deviations and problems
- Support decision-making
- Provide evidence for corrective action

Types of Reports

- Daily production report
- Weekly performance report
- Quality deviation report
- Productivity analysis report

Key Contents of a Report

- Production target vs actual output
- Labor and machine productivity
- Defect rate and quality issues
- Downtime details
- Causes of deviation
- Summary of findings

Reports must be:

- Clear and factual
- Based on accurate data
- Submitted on time
- Properly documented and approved

5.2 Recommendations to concerned departments for implementation

Recommendations are practical improvement actions suggested based on report findings.

Purpose of Recommendations

- Correct identified problems
- Improve productivity and quality
- Prevent recurrence of issues
- Support continuous improvement

Examples of Recommendations

- Maintenance department: repair or service machines
- HR/Training department: conduct skill development training
- Production department: balance workload or revise workflow
- Quality department: strengthen inspection procedures
- Procurement department: improve material quality control

Recommendations should be:

- Specific and achievable
- Assigned to responsible departments
- Provided with a timeline
- Followed up for implementation

Self-check - 7.5

Short Questions:

1. **Question:** What is a production report?
Answer:

2. **Question:** What is the purpose of preparing reports?
Answer:

3. **Question:** What are common types of production-related reports?
Answer:

4. **Question:** What key information should be included in a production report?
Answer:

5. **Question:** What are recommendations in production reporting?
Answer:

6. **Question:** What is the purpose of giving recommendations?
Answer:

Answer Key – 7.5

Short Questions with Answer:

1. **Question:** What is a production report?
Answer: A production report is a formal document that presents production data, performance results, and identified issues in a structured format.
2. **Question:** What is the purpose of preparing reports?
Answer: Reports communicate performance results, highlight deviations, support decision-making, and provide evidence for corrective action.
3. **Question:** What are common types of production-related reports?
Answer: Daily production reports, weekly performance reports, quality deviation reports, and productivity analysis reports.
4. **Question:** What key information should be included in a production report?
Answer: Production target versus actual output, labor and machine productivity, defect rate, downtime details, causes of deviation, and summary of findings.
5. **Question:** What are recommendations in production reporting?
Answer: Recommendations are practical improvement actions suggested based on report findings.
6. **Question:** What is the purpose of giving recommendations?
Answer: To correct problems, improve productivity and quality, prevent recurrence, and support continuous improvement.

Task sheet- 7.5

Task Name: Prepare Production Performance Reports and Recommend Improvement Actions.

Instructions:

Read and understand the directions carefully:

- This practical demonstration is based on the performance criteria from all or some of the units of competency in Industrial Productivity Improvement.
- This assessment activity will be used to measure your underpinning knowledge and skills
- You will have fifteen (15) minutes to familiarize yourself with the resources to be used
- You have one (1) hour to complete this demonstration.

Working Procedure:

- Collect verified production and quality data.
- Compare production target with actual output.
- Calculate labor and machine productivity.
- Analyze defect rate and quality performance.
- Review downtime records and major causes.
- Identify deviations and performance gaps.
- Summarize key findings clearly.
- Prepare structured report (daily/weekly/monthly as required).
- Develop practical recommendations based on findings.
- Assign recommendations to concerned departments.
- Include implementation timeline in the report.
- Submit report for approval and follow up on actions taken.

Specification Information:

1. Report Must Include:

- Production target vs. actual output
- Labor productivity and machine productivity
- Material productivity (if required)
- Defect rate and quality issues
- Downtime details
- Causes of deviations
- Summary of findings

2. Types of Reports May Include:

- Daily production report
- Weekly performance report
- Quality deviation report
- Productivity analysis report

3. Report Must Be:

- Clear and well-structured
- Based on accurate and verified data
- Submitted on time
- Signed or approved by responsible authority

- Properly documented for record keeping

4. Recommendations Must Be:

- Specific and achievable
- Based on root cause analysis
- Assigned to responsible department
- Provided with clear timeline
- Monitored for implementation

5. Examples of Improvement Actions:

- **Maintenance:** Repair or service machines
- **HR/Training:** Conduct skill development training
- **Production:** Rebalance workload or improve workflow
- **Quality:** Strengthen inspection procedures
- **Procurement:** Improve material quality control

Resources Required:

Tools and materials:	• Report preparation format/template • Computer or laptop • Spreadsheet software (e.g., Excel) • Calculator • Performance dashboard (if available) • Pen and documentation file
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